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NAVAL POSTGRADUATE SCHOOL
Monterey, California

AN ANALYSIS OF OFFICER ACCESSION PROGRAMS AND THE CAREER DEVELOPMENT OF U.S. MARINE CORPS OFFICERS

by

Levent Ergun

March 2003

Thesis Advisor: Stephen L. Mehay
Associate Advisor: William Bowman

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13. ABSTRACT

The purpose of this thesis is to identify and evaluate factors that affect career development of U.S. Marine Corps officers. The analysis includes evaluation of fitness reports, performance at The Basic School (TBS), retention, and promotion to O-4 and O-5 ranks. The primary goal is to explain the effect of officer commissioning programs on officers' careers.

The personnel database used for the analysis includes more than 28,000 Marines who entered between FY 1980 and 1999. The performance models assume that commissioning programs that provide longer and more intensive pre-commissioning acculturation, or that credit enlisted service experience, will be associated with better performance. Performance models are specified and estimated for TBS class rank, retention to 10 years of service, promotion to O-4 and O-5, and for a Performance Index (PI) derived from fitness report marks.

The findings indicate that commissioning source is an important determinant of officer performance. The results suggest that USNA graduates have better fitness reports at all grades between O-1 and O-4. However, officers from most of the other commissioning programs have higher O-4 promotion rates. On the other hand, officers from the three enlisted commissioning programs have significantly better TBS performance and 10-year retention rates. Bivariate probit model with sample selection finds that prior enlisted officers from all commissioning programs have lower O-5 promotion rates. MECEP and ECP increase O-5 promotion rates but do not completely eliminate the negative effect of being prior enlisted. The results also find that TBS class rank is a significant predictor of a Marine's future performance. Finally, the effect of sample selection in the stay-leave decision tends to bias downward the effect of commissioning source in the PI and promotion models. The results find that officers who leave are negatively correlated with average PI, O-4 and O-5 promotion probabilities.

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AN ANALYSIS OF OFFICER ACCESSION PROGRAMS AND THE CAREER DEVELOPMENT OF U.S. MARINE CORPS OFFICERS

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

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I. INTRODUCTION

A. BACKGROUND

There are seven different officer accession programs for Marine Corps officers: (1) the U.S. Naval Academy (USNA); (2) the Naval Reserve Officers Training Course (NROTC); (3) the Platoon Leader Course (PLC); (4) the Officer Candidate Course (OCC); (5) the Marine Corps Enlisted Commissioning Education Program (MECEP); (6) the Enlisted Commissioning Program (ECP); and, (7) the Meritorious Commissioning Program (MCP). The last three programs (MECEP, ECP, and MCP) are Fleet Accession Programs designed for qualified enlistees. Since these three programs comprise a relatively small percentage of all accessions, only eight percent of TBS classes for fiscal years 1980-1999, these programs are generally classified as one group by researchers, leaving five major accession programs.

One hypothesis is that significant differences among the graduates of the five major accession programs arise as a result of the differences in the degree of exposure to military culture. The USNA provides a long and intensive acculturation program prior to entry into the military, whereas NROTC falls somewhere between USNA and OCC in terms of exposure to military culture. At the other end of the spectrum, OCC and PLC provide only 10 weeks of training. One testable hypothesis is that longer and more intensive training yields better military acculturation, resulting in better officer performance. Prior researchers have used success at TBS, augmentation, retention and promotion to field grades as measures of officer career performance.

Prior studies on the effects of accession programs on the performance of Marine Corps officers find conflicting results. North and Smith (December, 1993) find USNA and ECP program participants have the best success at TBS, whereas ROTC and MECEP participants have a higher probability of promotion to major. In his study on the effect of graduate education on retention and promotion, Branigan (2001) compares three accession programs: USNA, NROTC and others. His multivariate models of O-5 promotion reveal that officers from "other" commissioning sources have a higher probability of promotion compared to USNA and NROTC graduates.

Multivariate models of officer performance have used explanatory variables that can be grouped into three categories: personal characteristics, cognitive human capital and affective skills. Although the variables categorized as personal background and affective skills are widely agreed upon, researchers have used several different variables for cognitive skills. General Classification Test (GCT) test scores, college GPA, college major and graduate education are some of the variables that are believed to be good proxies for cognitive abilities.

In some prior studies, a performance index derived from officer fitness reports has been used as a proxy for the cognitive abilities of officers. However, using a performance index as an explanatory variable in promotion models has yielded inconsistent results. Estridge (1995) finds that when a performance index is included in promotion models, the sign or magnitude of accession source coefficients changes. His O-4 promotion model shows that there is a strong positive effect of USNA graduation on the promotion probability after fitness report performance is held constant. On the other hand, Wielsma (1996) finds negative associations between promotion to O-4 and USNA and ROTC graduates. His models also find a surprising (and implausible) negative sign for the coefficient of the performance index variable, which means that officers with higher performance scores are associated with a lower chance of promotion. Finally, Branigan (2001) used a performance index to examine the effect of graduate education on promotion. The performance index in his promotion model reveals a consistently positive effect, as one would expect. He also finds that USNA and NROTC graduates are less likely to promote to O-5, compared to other accession program graduates, but the accession program variables are not statistically significant.

B. PURPOSE

The purpose of this thesis is to identify and evaluate the factors affecting career development of U.S. Marine Corps officers. The analysis will include an evaluation of fitness reports, performance at The Basic School (TBS), retention to 10 years of commissioning service (YCS) and promotion to O-4 and O-5 ranks. The primary goal of this study is to explain the effect of major officer accession sources on the careers of Marine officers.

C. RESEARCH QUESTIONS

- Do officers from some accession programs perform better than others at TBS?
- Are there significant differences among officers from various accession programs in terms of retention to 10 YCS?
- Are there observable differences between the fitness reports of Marine officers who leave before the O-4 promotion point compared to those of officers who stay?
- Do officers from some accession programs have a better promotion chance to the O-4 and O-5 grades?
- Are there significant differences among officers from various accession programs in terms of their fitness report scores?

D. BENEFITS OF THE STUDY

This study will attempt to examine officer accession programs and their effect on officer performance. In addition to commonly used performance measures like success at TBS, retention and promotion, fitness report evaluations of officers will also be examined as a performance variable. Depending on the results of the study, the Marine Corps may find it useful to further examine its accession programs. The Marine Corps might also be interested to reexamine the new performance evaluation system that was introduced in 1999 if the study finds the current system cannot differentiate between performances of officers as desired or significant signs of grade creep over time are observed.

E. SCOPE AND METHODOLOGY

The study will include an overview of current Marine Corps officer accession programs and the Marine Corps' promotion and performance evaluation systems. Data sets that are used in the statistical analysis are based on the Marine Corps Commissioned Officer Accession Career (MCCOAC) data file, and Marine Corps officer fitness report data files. The MCCOAC data file includes records of Marine officers for the fiscal year 1980-1999 cohorts. The combined, event-based data set includes variables taken from TBS files and Headquarters Master Files (HMF). It includes information on augmentation outcomes, MOS, promotion, and separation (Quester and Hiatt, 2001). It includes information on Marine officers in these 20 cohorts who started at TBS. The record for each person ends at separation or at the last update on 30 September 2000.

The analysis will use all 20 years of officer accession data in estimating the TBS performance models. Fiscal year (FY) 1980-1990 cohort data will be analyzed in the retention and O-4 promotion models, while FY 1980-1983 cohort data will be used in the O-5 promotion models. The fitness report analysis will create two different performance indexes from the fitness reports data sets: one for the period before the performance evaluation system changed in 1999 and one for the period after. The study will analyze these indexes as dependent variables in multivariate performance models.

Officer accession programs will be the focus of analyses. Since MCCOAC data have limited information on prior enlisted service, education level and college major codes of officers, some of these variables will be obtained from DMDC cohort data and merged with the MCCOAC data set.

F. ORGANIZATION OF THE STUDY

The study is organized into seven chapters. Chapter II provides an overview of the accession function and Marine Corps officer accession programs. This chapter also describes the Basic School (TBS), and the Marine Corps' promotion and performance evaluation systems. Chapter III reviews prior studies that have analyzed officer performance. These studies and their results are summarized in Chapter III under three topics: TBS performance, retention, and promotion. Chapter IV introduces the three data sets used in the study and explains how the data sets are merged and new variables are created for the purpose of the study. Chapter IV also gives some preliminary descriptive statistical analysis on the focus variables. The methodology and the models used in the analyses are discussed in Chapter V. Chapter VI presents empirical results from the models and includes explanations of the findings. Finally, Chapter VII summarizes the study, presents the conclusions and recommendations.

II. AN OVERVIEW OF THE U.S. MARINE CORPS' ACCESSION PROGRAMS AND PROMOTION AND PERFORMANCE EVALUATION SYSTEMS

This chapter describes the Marine Corps' personnel system and the career development of Marine officers. Officer accession programs are critical to career development as they impact different skills, aptitudes and training. The Basic School (TBS) at Quantico, Virginia is the only training program across the four services that provide all officers, regardless of occupational specialty, with identical training. This training plays an important role in each officer's future careers. This chapter also reviews the Marine Corps' officer promotion and performance evaluation systems.

A. ACCESSION

An officer career management system is comprised of four basic personnel functions: accessing, developing, promoting and transitioning (Thie and Brown, 1994). Depending on the policy decisions, alternative designs in each personnel function can create different career management systems to achieve different objectives. Thie et al. (2001) define all aspects of each of the four personnel functions in officer career management systems. They further detail these aspects by connecting them to alternatives made possible by applying different designs to each aspect.

Table 1.1 shows that the four personnel functions have 17 aspects, and each aspect has various alternatives (a total of 58 alternatives). For the scope of this study, I will elaborate on the accession function and detail the aspects that are associated with this function.

Table 1.1. Functions, Aspects and Alternatives Considered.

Function	Aspects	Alternatives
Accessing	Entry Point	Lateral from civilian
		Lateral from military
		Year 0
	Initial Tenure	2 Years
		4 Years
		6 Years
	Pre-entry acculturation	None
		Educational, high-intensity, short
		Educational, low-intensity, long
		Educational, high-intensity, long
		Experiential, medium intensity, medium
	Amount of obligated service for education, training	0.5 year
		1 year
		1.5 years
		2 years
Developing	Career selection point	None
		5-10 years
		8-10 years
		> 10 years
	Effect of nonselection	Separation
		Migration to new skills
	Average assignment length	Decrease by two-thirds of average
		Decrease by one-third of average
		Current length
		Increase by one-third of average
		Increase by two-thirds of average
	Military and civilian education	Current amount
		2 years more
		2 years less
Promoting	Promotion zone	Time in service
		Time in grade
		Combination
	Length of zone	Narrow (1-2 years)
		Broad (3-8 years)
		Open
	Opportunity	Fixed
		Selective (Based on requirements)
	Nature of continuation	Guaranteed
		Based on requirements
Transitioning	Vesting point	4-9 years
		10-15 years
		20 years
	Transitional ability of the system	Tenure
		Voluntary separation incentives
		Neither tenure nor incentives
	Maximum Career length	30 years
		35 years
		40
	Separation rates in first 10 years	High
		Medium
		Low

Table 1.1. Functions, Aspects and Alternatives Considered (cont.).

Function	Aspects	Alternatives
Transitioning	Retirement annuity point	15 years 20 years 25 years 30 years 35 years

From: Thie et al., 2001, p. 19.

1. Aspects and Alternatives of Accession Function

Accessing is a vital personnel function and plays an important role in future composition of the officer corps. Accessing relates to how officers enter the system and has four design factors policy makers can change: pre-entry acculturation, entry point, initial tenure, and amount of obligated service. Before categorizing Marine Corps accession programs created via alternatives of each aspect, I will review these aspects and define what Thie et al. (2001) mean by each of them.

a. Pre-Entry Acculturation

Acculturation is the process designed to familiarize individuals with military standards and make them fit into military life as best as possible. Alternatives in pre-entry acculturation are possible in two dimensions of the aspect: duration and intensity. Table 1.2 explains the alternatives of acculturation that a new officer will be exposed to before entry, which range from no pre-entry acculturation to long-duration and high intensity.

Table 1.2. Pre-Entry Acculturation and Alternatives.

No.	Alternative	Explanation
1.	No Pre-Entry Acculturation	Officers enter without any prior acculturation
2.	Educational, short, high intensity	Educational in nature, short duration, high intensity
3.	Educational, long, low intensity	Educational in nature, long duration, low intensity
4.	Educational, long, high intensity	Educational in nature, long duration, high intensity
5.	Experiential, short, high intensity	Experiential in nature, short duration, high intensity

b. Entry Point

Entry point refers to where, when and in what way an individual can join the service. Table 1.1 shows three alternatives for entry point aspect of the accession function. The first alternative is lateral entry from civilian life that credits experience in the private sector. The second alternative is lateral entry from the services or active duty credits for prior military experience. The third alternative is entry at the beginning of a career with no credit for prior experience.

c. Amount of Obligated Service

Thie et al. (2001) describe this aspect as the time officers should serve on active duty for the services to recoup pre-commissioning human capital investments in training or education. As an example, obligated Service for USNA graduates is five years on active duty, while NROTC non-scholarship participants serve at least three and a half years on active duty.

d. Initial Tenure

A critical aspect of accession is initial tenure, which is the amount of time an individual may serve prior to possible involuntary separation by the Services. Tenure can be limited for entry positions with or without an expectation of continuing into a career track. Unlike alternatives that use years for initial tenure in Table 1.1, I will prefer commissioning type to denote whether an accession program provides its graduates with a regular or reserve commission. Prior to 1996 about 50 percent of officers received regular commissions (as cited in Rostker at al., 1993, p. 11). However, in 1992 "… The 1992 National Defense Authorization Act mandated that all officers commissioned after September 1996 must enter active duty with reserve commissions and then pass through the augmentation process before receiving admission to the regular officer corps" (Hosek et al., 2001). Since that time, officers regardless of their commissioning source first receive reserve commission and then receive a regular commission upon promotion to O-3 or via an augmentation board.

e. Entry Ability

This aspect of accession is related to minimum requirements needed for entry (Thie et al., 1994). I will focus only on the academic requirements for entry into each program. Academic requirements for entry are generally defined in terms of

accepted minimum aptitude battery test scores. The primary tests used by the Services for such purposes are the Scholastic Aptitude Test (SAT), the American College Test (ACT) and the Armed Forces Qualification Test (AFQT.)[1] The alternatives derived by variations in each aspect of accessing function to classify the Marine Corps officer accession programs in this study are summarized in Table 1.3 below.

Table 1.3. Accessing Function, Aspects and Available Alternatives.

Aspect	Alternatives
Pre-Entry Acculturation	No Pre-Entry Acculturation
	Educational, short, high intensity
	Educational, long, low intensity
	Educational, long, high intensity
	Experiential, short, high intensity
Entry Point	Lateral entry from civilian life
	Lateral entry from Services or active duty
	Year 0
Amount of Obligated Service	Number of Years in Active-duty or Active Reserve Force
Initial Tenure	Regular Commission
	Reserve Commission
Entry Ability	Minimum SAT / ACT/ ASVAB EL score

2. The Marine Corps Officer Accession Programs

Each of the seven different accession programs of the Corps is unique in terms of its candidate pool, acculturation process and length. ECP, MECEP and MCP programs are developed to allow fleet (enlisted) accessions to Marine Corps. O'Brien (2002) and Finley (2002) explain each program in detail in their theses. I will replicate dominant features of each program and use a different classification method to emphasize the differences among them.

a. The United States Naval Academy (USNA)

The Naval Academy is a four-year undergraduate college that prepares professional officers with a Bachelor of Science degree prior to entry into the Navy or the Marine Corps. Engineering and Weapons, Mathematics and Science, Humanities and

[1] A subtest of ASVAB called Electrical Composite is used for this purpose. The Marine Corps EL score is derived by summing Arithmetic Reasoning, Mathematics Knowledge, Electronics Information, and General Science subsets (Mishoe, 2000, p. 46).

Social Sciences are the three divisions within which midshipmen choose one of the eighteen different majors available at USNA.

USNA is open to all civilian high school graduates and enlisted members of the Navy and the Marine Corps. Regular and reserve enlisted members of the Navy and USMC compete for 170 appointments allotted to enlisted applicants (Mishoe, 2000). In terms of competitiveness USNA is highly selective and its engineering programs rank top amongst other U.S. colleges. Each year approximately 10,000 applicants seek admission into USNA and accepted class size is about 1,200. To evaluate applicants the USNA admission board uses a whole person multiple that incorporates seven different success qualities; SAT scores comprise 36 percent of the multiple (Fitzpatrick, 2001). Enlisted applicants should achieve at least 1050 combined SAT (or equivalent ACT) score whereas there is no minimum SAT score requirement for other applicants. However, considering the number of applicants, higher SAT scores merit higher chances for receiving nomination and better candidate multiple scores.[2] Average combined SAT score for USNA class years of 1990-1999 was 1231 (Mishoe, 2000).

Midshipmen receive both academic education and military training during their four years at USNA. Training at the Naval Academy starts with a seven-week indoctrination program called Plebe Summer. At the end of each year are various summer training programs designed to increase midshipmen's general and tactical military skills, experiences, and leadership abilities. The Marine Corps can select up to 16 2/3 percent of the graduating class from the Naval Academy based on a 1964 Memorandum of Agreement between the Navy and USMC (O'Brien, 2002). Midshipmen who select to join the Marine Corps attend a four-week Leatherneck Training Program conducted by Naval Academy staff at The Basic School in Quantico, Virginia. For USNA graduates, the minimum service obligation is 5 years in active duty and 3 years in a reserve status.

b. Naval Reserve Officer Training Course (NROTC)

The NROTC Marine option is the second program shared with the Navy, which allows a maximum percentage of 16 2/3 of all NROTC attendants. The NROTC program provides scholarship or non-scholarship options at more than 65 NROTC units

[2] Each applicant must receive a nomination from various political sponsors, such as the President, the Vice-President, members of Congress or the Secretary of the Navy.

at selected colleges and universities for undergraduate students to pursue careers as commissioned officers in the USMC. NROTC is also open to eligible active duty enlisted Marines. Non-scholarship program (college program) participants receive uniforms and a small stipend during their last two years at college. If they accept a commission these officers incur eight years of military service obligations, at least three and a half of which must be on active duty. Scholarship program participants receive full tuition, all college educational fees, uniforms, a stipend for textbooks, and monthly allowance. Similarly, these midshipmen incur eight years of military service obligation, four of which must be served on active duty (NROTC Web Site, December 2002). Minimum qualifying score on Scholastic Aptitude Test (SAT) for the Marine Option NROTC program is a composite score of 1000. Selection for the Marine option program occurs during the junior or senior college year.

In addition to their academic courses, NROTC midshipmen receive military training from three sources. First, they attend naval science classes such as leadership, navigation etc. on campus in addition to their regular academic course load. ROTC unit plans training throughout the year and Marine Corps operational forces provide practical training during summers. Finally, Marine option midshipmen attend a six-week screening and evaluation program called "Bulldog" at Officer Candidate School.

c. Platoon Leader Course (PLC)

The PLC program is open to all college students attending accredited colleges and universities. Eligible college students can enroll in the program during any consecutive years of their college education. The program is designed to provide college students with an opportunity to join the Marine Corps without interrupting their course of academic study.

To be eligible for the program, college students should complete at least one academic term with an average GPA of "C" (2.0 on a 4.0 scale). The military training is limited to two 6-week summer Officer Candidate School (OCS) training sessions for students who enroll as college freshmen or sophomores. Members who enroll during or after their junior year of college attend a single 10-week OCS training session. PLC participants are not obliged to serve on active duty until they graduate. Upon receiving a

reserve commission, graduates incur eight years minimum service obligation in the Marine Corps Reserve. Although varying with the contract type, at least 3 years of this eight-year period should be served on active duty.

d. Officer Candidate Course (OCC)

OCC is a commissioning program open to seniors and graduates of accredited colleges and universities. The main difference between PLC and OCC is the year of college the applicant is in at the time of application. Individuals accepted into the program attend a 10-week training session at OCS. Participants receive a reserve commission as a second lieutenant in the USMC upon successful completion of training and report to The Basic School for initial officer training. Minimum service requirement is the same as PLC program; again, active duty service is generally three years, as specified in service agreements.

e. Enlisted Commissioning Program (ECP)

ECP allows qualified and selected Marines serving on active duty and in the Marine Corps Active Reserve to apply for assignment to Officer Candidate School. The program provides enlisted Marines who currently have a four-year degree with the opportunity to move into the officer corps. Upon successful completion of OCS, Marines are commissioned as a second lieutenant. Officers are required to serve at least eight years in the Marine Corps Reserve from the date of commissioning. Any portion of this eight-year period not served in active duty is served on inactive duty as a member of the U.S. Marine Corps Reserve.

f. Marine Corps Enlisted Commissioning Program (MECEP)

MECEP is designed to provide outstanding active duty enlisted Marines the opportunity to become officers. The program allows qualified Marines to attend colleges with an NROTC unit on campus as a full time student. E-4s and above in the top 50 percent of their class can apply if they achieve a minimum combined SAT score of 1000 with a minimum SAT verbal score of 400. Participating Marines receive full pay and allowances during the program and remain eligible for promotion in their MOS. Meeting the costs of tuition, books, housing and living expenses is each Marine's responsibility during education. MECEP students participate in training with their college NROTC unit and also attend the same six-week "Bulldog" program at TBS as NRTOC

midshipmen attend. Upon assignment to a college, enlisted Marines must agree to reenlist to have 6 years of obligated service in the Regular Marine Corps. Candidates are appointed as second lieutenants after they successfully graduate from college, complete bulldog course at OCS and MECEP on-campus training. Minimum service requirement is four years as commissioned officers for program graduates.

g. Meritorious Commissioning Program (MCP)

The program creates an opportunity for highly qualified enlisted Marines in the Regular and Active Reserve programs who do not possess a baccalaureate degree to become officers. The process starts by the nomination of commanding officers and proceeds through a selection board to determine eligible Marines. To be eligible, in addition to having a high school diploma and a minimum combined SAT score of 1000 (or ACT equivalent), applicants must have satisfactorily earned an associate's degree or completed at least 75 hours of college work at a regionally accredited college or university. Upon selection, Marines receive orders to report for a 10–week Officer Candidate Course at OCS. Candidates who successfully complete OCS are appointed to the grade of second lieutenant in the Marine Corps Reserve. Officers commissioned through the MCP must pursue their four-year baccalaureate degree during their initial service to be competitive for future promotion. The minimum obligated service requirement is the same as that in ECP program, which is at least eight years in the Marine Corps Reserve from the date of commissioning.

3. Classification of Accession Programs

Having explained the accessing function and described Marine Corps officer accession programs, it is now possible to classify each of the seven commissioning programs in terms of their specific features with one of the alternatives in Table 1.3. Table 1.4 below illustrates each officer accession program and five aspects of the accessing function.

Table 1.4. Officer Accession Programs and Accessing Function Aspects.

Accession Program	Pre-Entry Acculturation	Entry Point	Obligated Service	Initial Tenure [a]	Entry Ability
USNA	Educational, long, high intensity	- Year 0 - Lateral entry from active duty	5 Years in active-duty, Total 8 Yrs.	Regular Commission	Whole Person Multiple
NROTC	-Educational, long, low intensity	- Year 0 - Lateral entry from active duty	4 Years in active-duty, total 8 years	Scholarship: Regular Commission College Program: Reserve Commission	-SAT: 1000 composite - ACT: 45 - EL : 115
PLC	Short, high intensity	Year 0	3 Years in active-duty, total 8 years	Reserve Commission	First term college GPA completion with at least C grade.
OCC	Short, high intensity	Year 0	3 Years in active-duty, total 8 years	Reserve Commission	College Graduation
ECP	Experiential, short, high intensity,	Lateral Entry from Active duty	8 years in MC reserve	Reserve Commission	College Graduation
MECEP	Educational, long, low intensity	Lateral Entry from Active duty	4 years in active-duty	Regular Commission	- SAT: 1000 - ACT: 45 - EL: 115
MCP	Experiential, short, high intensity	Lateral Entry from Active duty	8 years in MC reserve	Reserve Commission	Associate's Degree or at least 75 hrs. College work, - SAT: 1000 - CT: 45 - EL: 115

[a] After 1996 all officers receive reserve commissions.

As Table 1.4 illustrates, the three sources (USNA, NROTC, and MECEP) are designed to provide long pre-entry acculturation in "officership" to ensure a better fit between the individual and the needs of the Marine Corps. PLC, OCC and ECP programs are designed to answer officer requirements, which are not met by the former three programs, in a quick way, hence Thie et al. (1994) refer to them as "shorter response programs." Relying heavily on having a college degree as the primary indication of potential for being officer, these programs provide the minimum screening and acculturation to enable these individuals to meet junior officer needs. Other alternatives like ECP and MCP depend on acculturation provided during prior enlisted service, and to some extent values it more than the prerequisite of possessing a college degree (as in MCP).

4. Trends in Accession Program Participation

Table 1.5 illustrates the commissioning source for entry cohorts between 1980-1999. Since the number of midshipmen to be selected into the Marine Corps is limited to 16 2/3 percent of each USNA and NROTC class, percentage changes in these two programs do not reflect the USMC's preferences for these programs over time. The PLC and OCC programs comprise approximately 50-60 percent of each entry cohort. The fluctuations in yield percentages of OCC (from 9.3 percent in 1988 to 25.18 percent in 1989) explain its shorter response attribute and its goal of making up for shortfalls in officer accessions from the primary programs. The only noticeable trend among programs is observed for MECEP that has consistently increased over time. The increase is a signal of the Marine Corps' preference for officers with prior service. It appears that individuals with prior service acculturate well and provide potential career officers.

Table 1.5 Distribution (in %) of Entry Cohorts by Commissioning Program and Year.

Year (Cohort Size)	USNA (%)	NROTC (%)	PLC (%)	OCC (%)	MECEP (%)	ECP (%)	MCP (%)	OTHER	MISSING[a]
1980 (1514)	13.14	18.30	31.18	20.67	1.52	3.96	0.2	0	11.03
1981(1449)	9.25	18.63	36.37	21.81	2.69	4.35	0.14	0	6.76
1982 (1641)	8.53	14.99	36.14	32.72	2.68	3.84	0	0	1.10
1983(2089)	8.76	13.45	36.57	34.94	2.01	3.45	0	0	0.81
1984 (1540)	10.58	18.83	50.97	15.13	1.95	2.34	0	0	0.19
1985(1361)	12.64	20.65	43.94	15.50	2.94	4.19	0	0	0.15
1986 (1352)	12.50	22.49	42.23	14.28	2.59	5.55	0	0	0.37
1987(1642)	10.78	20.71	35.93	25.64	2.86	3.41	0	0	0.67
1988 (1372)	13.05	25.66	46.57	9.33	3.28	1.82	0	0	0.29
1989(1497)	7.55	23.85	35.80	25.18	3.94	2.87	0	0	0.80
1990 (1210)	7.77	24.96	40.91	19.26	3.88	2.81	0	0	0.41
1991(1326)	7.32	23.00	35.52	28.28	3.39	2.04	0	0	0.45
1992 (1344)	10.79	20.76	26.34	33.78	4.99	2.53	0.15	0	0.67
1993(1199)	12.68	19.10	39.87	20.02	4.67	2.34	0.58	0	0.75
1994 (1205)	18.76	18.26	41.0	12.86	3.24	2.66	0.50	1.83	0.91
1995(1251)	9.67	14.39	39.65	26.70	4.16	3.52	0.80	1.12	0
1996 (1408)	11.58	14.63	31.82	26.07	5.33	6.53	2.63	0.92	0.50
1997(1217)	12.49	12.24	29.91	33.36	3.29	4.77	2.88	1.07	0
1998 (1380)	10.80	12.32	20.51	40.14	7.61	3.91	4.42	0.29	0
1999 (1061)	12.06	14.99	13.67	39.30	10.18	4.81	4.43	0.57	0
Average	11.04	18.61	35.75	24.75	3.86	3.59	0.84	0.29	1.29

From: Derived from MCCOAC data set .

B. THE BASIC SCHOOL (TBS)

After earning a commission via one of the above seven programs, all Marine officers attend TBS at Quantico, Virginia. The six-month intensive training curriculum aims to develop officers in five areas: leader/commander, decision maker, communicator, warfighter/executor, life-long learner. The mission of TBS is

> …to educate newly commissioned officers in the high standards of professional knowledge, esprit de corps, and leadership required to be prepared for duty as a company grade officer in the operating forces, with particular emphasis on duties, responsibilities and warfighting skills required of a rifle platoon commander (TBS Order P5000.2D, 2001 as cited in Finley, 2002, p. 26).

TBS has six companies that train classes of 220-250 officers consecutively with two-month lapses around the year. A seventh company exists for warrant officer training. Each company is commanded by a major and has six platoons with captains as platoon leaders. All of the seven company commanders report to TBS Command Element, which is commanded by a lieutenant colonel. The Instruction Battalion supports training, provides expertise and demonstrates leadership in all phases of the course to educate and train the Marine Corps' newest officers (TBS Web Site, 20 December 2002).

Instruction at TBS is introduced to officers with blocks that build upon one another. The instruction begins in the classroom environment and follows in sand table exercises and field applications. Classroom training comprises 60 percent of the total 1563 instruction hours, and 633 hours (40 percent) are devoted to field training (TBS Command Brief, TBS Web Site, 11 December 2002).

Leadership, academics and military skills comprise the three evaluation criteria in which officers must achieve "course mastery" to be able to graduate and report to Military Occupational Specialty (MOS) schools. An average of 75 percent is required to pass each skill area.

Leadership evaluations are the responsibility of company staff. Staff platoon commanders receive feedback from assistant instructors and submit their evaluations during the 12th and 22nd weeks of instruction. Peer rankings also play an important role in leadership evaluations. The TBS testing officer of TBS determines each company's

overall leadership ranking by weighting staff evaluations and peer rankings by 90 percent and 10 percent, respectively.

The second criterion, military skills, evaluates each officer's warfighting abilities and is based on practical application events. Fitness reports, land navigation, rifle and pistol qualifications are some of the 17 graded military skills that comprise the overall military skills grade of officers (Finley, 2002).

The academics portion of evaluations examines each officer's understanding of doctrines, procedures and concepts. The evaluations are via written tests conducted in the classroom environment. Twelve different evaluative exams are used to assess officers in academics.

Upon conclusion of training, officers have a separate GPA from each of the three evaluation criteria and are sorted and assigned a TBS class rank according to an overall GPA, which is calculated by weighting the three separate performance grades. Leadership grades contribute 36 percent weight while the military skills and academics are each weighted 32 percent.

TBS instruction has a significant role in a Marine officer's future career in three ways. First, depending on the overall class rank at TBS, Headquarters Marine Corps assigns a lineal rank for all Marines in the active-duty list.[3] Lineal precedence is important for a Marine officer as Marine Corps Bulletin 1400 explains "Initial assignment and maintenance of lineal precedence affects each officer's seniority, provides the sole basis for determining an officer's eligibility for promotion, and drives the timing of the officer's promotion once selected."

Second, TBS assigns MOSs to lieutenants that will impact a Marine officer's future career directly. MOS assignment is based on a quality-spread approach that ensures that every occupational field receives a fair share of the most competitive lieutenants. MOS selection process is completed at approximately the 14th training week

[3] "The Officer Lineal Precedence System is a part of the Marine Corps Promotion System and was established to maintain the current lineal and promotion history of all officers in the U.S. Marine Corps and U.S. Marine Corps Reserve. … Permanent precedence is assigned according to overall class average at TBS for all officers who were commissioned since 15 September 1981. … Once established, lineal precedence is normally only changed by promotion or appointment to the next higher grade." (MC Bulletin 1400, July 2002)

of the course. Again, overall class standing is the measure of competitiveness and one-third of the quotas for each MOS are obtained from the top, middle and the bottom thirds of each company (MOS Selection Booklet, Virginia Tech Naval ROTC Web Site, 2002).

Finally, the overall success of officers at TBS has predictive value in terms of retention and promotion in the forthcoming years. Prior studies find that officers with higher class standings are more likely to stay to the O-4 promotion point and to be promoted to O-4 (Wielsma, 1996).

C. MARINE CORPS PROMOTION SYSTEM

1. Significance of Promotion in the Military

Two policy choices influence and determine career patterns in organizations: entry point and basis of leaving. People either enter the organization at the beginning of the career path (closed organization) or they can enter at any point along the career (open organization). In terms of leaving, people either leave at their choice (natural attrition) or the organizations decide who will leave (forced attrition). In the military, forced attrition has been primarily implemented through the promotion system (Thie et al., 1994). Like the other three Services, the Marine Corps uses an up-or-out career flow structure. The up-or-out system provides incentives for continued performance and allows the Services to retain their best personnel. Specific to this structure is forced or induced attrition, which has been tied to promotion (failure to promote) at certain career points.

The military is unique in being the only institution in which the officer profession can be practiced. Put another way, an officer has to stay in the military to be able to perform his or her profession. Unlike the profession of a doctor that can be practiced at one hospital or another, the profession of arms can only be practiced in the military. Thus, under forced attrition, an individual's profession ends when his service ends. From this perspective, the promotion system in the military is not only related to movement to higher grades, but also sets the foundation for continuation of one's profession. Rostker et al. explain how DOPMA was designed to combine the retention and promotion functions.

> The "up" portion of the "up-or-out" system provides that, in general, officers move through the system in "cohorts" originally determined by the year of commissioning, and compete for promotion to the next higher

> grade against other members of the group at set *years-of-service* (YOS) points. The "out" portion of the "up-or-out" system provides that "officers twice passed over for promotion, after a certain number of years, depending upon their particular grade, are to be separated from active service, and if eligible retired." There are, however, exceptions to the mandatory separation rules. DOPMA provides for *selective continuation* on active duty of officers who have twice failed selection for promotion. It was Congress's expectation that O-4s who failed to be selected to the next higher grade would be permitted to remain on active duty until they were eligible to retire at 20 years of service. (Rostker et al., 1993, p. 12)

The promotion system uses a "fully qualified" approach for first lieutenant and captain selections. Promotion to O-4 and above is on the basis of "best qualified." The Defense Officer Personnel Management Act of 1980 (DOPMA) establishes a standard for career progression and an officer management system built around a uniform application of how military officers should be trained, appointed, promoted, separated, and retired. DOPMA aligns the procedures among the four services and sets promotion percentages for each grade (Hosek et al., 2001). The promotion opportunity to each grade and the cumulative probability of promotion to each grade for the original cohort (derived from DOPMA) are presented in Table 1.6.

Table 1.6. DOPMA Model of Officer Careers.

Grade	Promotion Opportunity [a] (% promoted)	Promotion Timing (YOS)	Career Expectation	Cumulative Probability to Grade from Original Cohort (Includes attrition)
O-2	100 % if fully qualified	2,0	2 x nonselect & separation	96%
O-3	95 %	3,5/4	2 x nonselect & separation or may be allowed to stay on active duty until retirement at 20 YOS	82 %
O-4	80%	10±1	2 x nonselect & separation or may be allowed to stay until 24 YOS; normal retirement at 20 YOS.	66%
O-5	70%	16±1	30% of 2X nonselectees can be retired before normal (28 YOS) retirement.	41%
O-6	50%	22±1	Normal retirement at 30 YOS, but 30% early retirement possible after 4 years in grade.[b]	18%

[a] $\text{Promotion Opportunity} = \left(\frac{\text{\# of officers authorized to be selected}}{\text{\# of officers in the in-zone}} \right)$ (See MCO P1400.31B, 2001, p. 1-4).

[b] More than 30 percent of both O-5 and O-6 officers can retire early if considered more than once prior to reaching mandatory retirement.

From: Rostker et al., 1993, p. 14.

2. Promotion to Higher Grades

Promotion to O-2 is nearly automatic as most officers are still serving their initial service obligation at this promotion point. Most of the officers who leave during the first two years fail in basic military or occupational training.

Officers, depending on their accession programs, generally complete their initial service obligation as O-3s level and about one-third of each cohort voluntarily leaves at this point. Compared to O-2, promotion to O-3 and above is designed to be more challenging and involves a competitive promotion board review. However, as Table 1.6 illustrates, promotion opportunity to O-3 is high (95 percent). Considering the separation rate at this point, promotion to O-3 is nearly automatic for the survivors. Promotion to O-4 and above is completely different as it is the first truly competitive promotion.

Promotion to major, which occurs roughly at 10 years of service, can be viewed as a career selection point. Almost 50 percent of the officers from the same commissioning year make it to 10 YOS (Quester and Hiatt, 2001). Of the surviving officers, about 20 percent will not be selected. Of those not-selected, the officers who have at least 18 active-duty YOS (including prior enlisted service) are allowed to continue until retirement (Section 573, Chapter 36, Title10 U.S. Code). In recent years, however, the Marine Corps began to use selective continuation authority, as allowed by DOPMA and encouraged by the Congress, to keep majors with at least 15 YOS who are passed over twice (at the O-5 board) until the 20-year retirement point.[4] Continuation decisions are taken by continuation boards, which are composed of the same members of each promotion board upon conclusion of the selection process.

Achieving more senior ranks (O-5 and higher) is highly competitive and also based on professional credentials. Promotion opportunity to O-5 is much smaller -70 percent- as compared with that of junior ranks. Second, officers reaching O-5 also receive eligibility for retirement at 20 YOS if not promoted to higher grades. To increase their chances of promotion to O-5, officers must have excellent records of performance. Having served in challenging and key positions is as meaningful as having a good record of success. On the other hand, differences among military occupation specialty (MOS)

[4] The House Report 3296-1462 notes "It is the committee's strongest desire that …only in unusual circumstances would this authority not be fully utilized" (as cited in Rostker et al., 1993, p. 13).

groups become significant, as senior billets in non-combat MOSs are limited. However, the Marine Corps does not use "promotion by MOS."

The Marine Corps Promotion Manual explains the requirements for active duty officers to be eligible for promotion to higher grades. The minimum requirements include being on the active duty-list, having completed the minimum time-in-grade and being identified in the Promotion Plan for an opportunity for selection. The Performance Evaluation System (PES) asserts the significance of fitness reports. Fitness reports are "the primary means of evaluating a Marine's performance." However, neither these minimum requirements nor fitness reports tell eligible officers much about what counts favorably for higher promotion probabilities and what credentials the board members weigh more heavily. Experiences by the Board members who have served on prior promotion boards are highly valued by junior Marine officers.

3. The Marine Corps Selection Process

Title 10 United States Code (USC) provides for a single promotion process for all officers on the Active Duty List (ADL), regardless of their service branch.[5] Commissioned officers are recommended for promotion by their commanders, and are selected by centralized (service-wide) promotion boards, based on the officers' promotion records. Promotion board deliberations are based on three types of information sources: official military personnel file (OMPF); written communications by eligible officers; and discrepancy notes. OMPF is the primary source of information and contains fitness reports, awards, any reports of punishment or admonishments, any military and civilian credentials and other information. Finally, files include a recent photograph of the individual, which is used to evaluate military bearing.

Instructions about the composition and proceedings of each promotion board are released by "precept" which constitutes the legal document ordering a selection board to convene. The precept is a letter from the Secretary of the Navy to the president of the board. The precept appoints the president and members of the boards. To protect the members from improper influence, the precept is not released until the Board actually

[5] Each Service maintains a single list of officers who are on active duty in the order of seniority of the grade in which they are serving on active duty. Warrant officers and officers described in Section 641 of Title 10 USC are kept on separate active-duty lists (U.S. Code Title 10, Chapter 36, Section 620).

convenes (MCO 1400.31B, 2000). Precepts include information that the Secretary of the Navy deems important for selection of officers to the next grade, but should not convey information on particular officers (SECNAVINST 1420.1A, 1991). The precepts should, however, include guidelines on the needs of the Service for officers having particular skills. Additionally, precepts ensure that appropriate consideration is given to joint officer management and minority status issues (DODINST 1320.14, 1996).

An exception to excluding information on particular officers is the inclusion of "skill guidance" in the precepts. The Marine Corps Promotion Manual defines a skill shortage as "any MOS that is 85 percent or less of the staffing goal for the grade being considered for selection." Hence, information on officers in such groups is generally furnished to boards by their MOS group codes. Another guideline covers the issue of joint officer management. Chapter 38 USC, Title 10 defines joint officer management. As detailed in CJCSI 1330.02A (1997), officers serving in or who have served on the Joint Staff, Office of the Secretary of Defense Staff or in Other Joint Duty (these positions are defined by law) are expected to be selected for promotion at a rate not less than the rate for officers in the Marine Corps who are serving on or who have served on their Service's Headquarters staff. The Chairman of the Joint Chiefs is charged by law to ensure that the boards act consistently with the guidelines. Another important evaluation guideline addresses the effect of marital status. Department of Defense (DOD) Instruction asserts that the employment, education, or volunteer service of a spouse should have no effect on the promotion opportunities of that member. Finally, precepts also set equal opportunity guidelines in accordance with DoD Directive 1320.12.

A group of officers who compete amongst themselves is referred to as a "cohort." Cohorts are determined according to the Five-Year Officer Promotion Plan of the Marine Corps. The plan contains selection opportunities, zone sizes, numbers authorized to select and any guidance for each grade and competitive category as approved by the Secretary of the Navy. The promotion plan is released at least 30 days prior to the convening date of a selection board. Although officers compete within their cohort regardless of their MOS group, competition is limited to officers in the same "category" only. The Marine Corps has five different groups of officers called competitive categories: "unrestricted," "restricted (limited duty officers)," "warrant/chief warrant officers," "specialist officers"

and "active reserve officers" (MCO P1400.31B, 2000). Each category possesses disparate career paths and related skills. Unrestricted officers fill the majority of billets in the Marine Corps and comprise the major focus of the Marine Corps promotion system. The unrestricted officer promotion process is focused on the selection of officers for promotion who have "the potential to carry out the duties and responsibilities of the next higher grade" (Vasquez and Williams, 2001).

The third document in the promotion process is the convening message. The Commandant of the Marine Corps provides a general written notice for each grade, which is transmitted by a standard naval message (MARADMIN) to all eligible officers. At a minimum, this message includes convening date of the board, the name and date of rank of the senior and junior officer in the "in-zone" and "below-zone" populations, and other administrative notices. DOPMA system not only provides a standard career progression for officers, but also provides for early and late promotion (Rostker et al., 1993). In simplest terms, each selection board considers officers in three cohorts. The issue of this message groups all eligible officers to be considered by promotion boards in three categories: above, below and in-zone.

The Marine Corps promotion Manual (MCO P1400.31B, 2000) defines promotion zone by "… eligibility category consisting of officers from the most senior to the most junior officer eligible for consideration before a selection board in the same grade and competitive category." For Marine Corps promotions to major through colonel, officers compete both below-the-promotion zone, as well as in- and above-the-promotion zone.

Above-zone: Officers in this zone have been previously considered in the in-zone population, but were not selected for promotion by the board.

In-zone: Officers in this zone comprise the primary eligible population for consideration by the selection board.

Below-zone: Below-zone officers are junior to other officers in the promotion zone. If not selected, these officers do not incur a failure of selection. This group is a rough estimate of the following year's in-zone population. Title 10, USC limits the

number of below-zone officers that can be selected to 10 percent of the "authorized to select number."[6]

Once the board convenes and begins its sessions, all eligible officers are assigned randomly to each board member. Board members review their in-zone cases to have an understanding of the competitiveness of the in-zone population. Members review all above- and below-zone cases upon completion of in-zone cases. During the first session called "in-out session," board members brief all above-zone and below-zone cases and the board decides if an eligible officer's record is competitive enough to merit being a "premier" case. Premier cases are briefed and voted with the in-zone officers' cases. The criterion to be a premier case is to get at least one affirmative vote from any member of the selection board.

Once all premier cases are determined, in addition to the in-zone group, each eligible officer receives a full brief by the member assigned. These briefs usually take 5-8 minutes depending on the number of eligible officers. After all cases have been briefed to the board, the voting process begins and each member cast his or her vote "yes" to select or "no" to pass. The number of "yes" votes a member can cast cannot exceed the number of officers authorized to select (MCO P1400.31B, 2000).

One of the last actions of the promotion board is to confirm that the below-zone select records are indeed better quality records than the in- and above-zone non-select records, since below-zone promotions come at the expense of the in- and above-zone officers. The entire board compares the lowest below-zone select record to the highest scoring for in-zone or above-zone non-select record. A majority of the board members must agree that the below-zone record is better than the in-zone or above-zone record for the officer from below-zone to "displace" the in- or above-zone officer. If it is not better, that in-zone or above-zone officer becomes a select and the below-zone officer becomes a non-select.

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[6] Each selection board is authorized to select to the next higher grade a specific number of officers. Officer accessions, attrition, requirements, Congressional and secretarial authorizations, and budgetary constraints impact the "authorized to select number". For each unrestricted and Reserve board this number will fluctuate or float until the day the board convenes. (MCO 1410.31B, 2000)

D. MARINE CORPS PERFORMANCE EVALUATION SYSTEM (PES)

As in the other three Services, the Marine Corps uses written performance evaluations to evaluate its personnel. These written performance reports are called "fitness reports," or "fitreps." The system is used for all personnel in grades of sergeant through major general and provides for periodic reporting, recording and analysis of the performance and professional character of Marines. The Marine Corps Performance Evaluation System defines the fitness report as the "…primary means for evaluating a Marine's performance to support the Commandant's effort to select the best qualified personnel for promotion, augmentation, resident schooling, command and duty assignments " (MCO 1610.7E, 1998).

Two officers are authorized to report on each Marine: a reporting senior (RS) and a reviewing officer (RO). The RS is the first commissioned officer (or civilian GS-9/equivalent or above) in the reporting chain that is senior to the Marine and in the best position to evaluate the Marine's performance and character. The RO is the first commissioned officer (or civilian GS-10/ equivalent or above) senior in grade to the RS and responsible for the supervision of the RS. A third officer sighting is required if the report is "adverse" in nature. The third officer sighter is normally the reporting senior of the RO. General or flag officers should sight all adverse officer reports.[7]

During the past 50 years the Marine Corps has modified the fitness report form several times to achieve more accurate assessment and reporting of Marines' performances. Two most recent report forms are described in the following sections since some parts of the statistical analyses in Chapter V involve data from fitness reports.

1. Performance Evaluation System Before 1999

There are 11 occasions when a fitness report submission is required for a Marine. These occasions ensure that a continuous chain of performance evaluation record is generated. Continuous reporting also reduces situations where a Marine works with two different reporting seniors but gets evaluated only by the last one. The primary fitness report occasion is 'annual,' which requires fitness reports for all marines but lieutenants. First and second lieutenants receive semi-annual reports. Other occasions that require

[7] The duties and responsibilities of a third officer sighter involve adverse fitness reports. (See MCO P1610.7e , December 1998, p. 2-6).

fitness reports include change of grade, or change of duty or reporting senior. Marines also receive a fitness report when they are assigned temporary duties in excess of 30 days. This is the only exception to the policy of requiring a minimum of 90 days of observation (30 days for lieutenants). Finally, a fitness report is submitted in unusual cases like desertion, missing in action, end of service or directed by the Commandant of the Marine Corps. To keep an ongoing evaluation cycle all reports cover the period since the last fitness report was submitted regardless of the occasion. Hence, all reports are equally important.

Appendix A contains a copy of a fitness report form used prior to 1999. The report format consists of two pages that include four sections (A to D) and conclude with reporting and reviewing officer certification parts. Section A includes descriptive information that covers current duty, personal information on the Marine and RS, type and occasion of report, period covered by the report, Marine's rifle, pistol and physical qualifications and finally three duty preferences by the Marine for his/her next assignment.

Section B includes nine items (items 12-20) for RS to assess the performance of a Marine during the reporting period. Item 12 is checked to denote the report is "unobserved," which is required because of insufficient observation time or when another report is due for less than 90 days. Item 13 has seven factors to allow evaluation of the Marine's duty performance. Item 14 includes 14 factors for evaluation of professional qualities and characteristics of the Marine. These (21) traits have a six-point scale for marking: unsatisfactory, below average, average, above average, excellent and outstanding. Item 15, Potential and Preference Factors, allows the RS to assess the Marine in relation to all Marines of the same grade for whom the evaluator is the RS at the time of the report, regardless whether these officers receive fitness reports from the RS at this time or not. Item 15 does not provide an average of the marks in items 13 and 14, but rather reflects the relative assessment of the Marine compared to his or her counterparts in the unit. Unlike a six-scaled measurement in items 13 and 14, ten scales are possible for item 15 with the inclusion of "below average–average, average–above average, above average-excellent, excellent-outstanding" marks. Item 16 reflects the RS's choice on "having the Marine under his or her command during service in war." This

allows the RS to evaluate the Marine on a four-point range starting with "prefer not" and reaching "particularly desire" options. Item 17 includes options to denote information on the Marine if he or she has been the subject of any commendatory, adverse or disciplinary action reports during the Fitrep period. Item 18 explains the frequency and degree of observation of the Marine's performance by the RS. Item 19 reflects the opinion of the RS on promotability of the Marine. Although there are two options to express opinion either in favor or against promotion, a third option is possible for the RS to nominate the Marine for accelerated promotion by leaving both marks unchecked. Such a mark sends a signal to the promotion board and may be significant for rendering the Marine a premier case for below-zone promotion. In item 20, the RS either concurs with the Marine's three duty preferences or recommends a different duty assignment.

As Appendix A illustrates, Section C allows for narrative and perceptive insights into the Marine's duty preferences, performance, character and overall value. The RS is restricted to the space provided in Section C unless the report is adverse or includes accelerated promotion remarks. The reporting senior has to include mandatory explanatory comments in this section for certain marks in Section B such as not observed/extended or combat reports, commendatory or additional duty marks that need to be clarified by further explanations.

Section D certifies the correctness and impartiality of the report by the RS. This section allows the "Marine Reported On" (MRO) to write statements to argue the remarks by RS if the report is determined to be adverse.[8] On the second page, the reporting senior completes certification by listing all Marines of the same grade as the MRO who were under his or her command at reporting date. If the RS marked the Marine as "outstanding" in item 15 a, the RS enters the numerical ranking of the Marine compared to others only in the outstanding category.

The last part of the second page of Fitness report form in Appendix A is allotted for RO certification. The RO has four options depending on his or her opportunity to observe the Marine. If the RO does not concur with the reporting senior's mark in item

[8] An adverse report includes at least one of the following marks: show failure of marksmanship or PFT in item 5a, marks less than average in items 13,14 or 15a, an entry of "prefer not" in item 16, an entry of "yes" in items 17b and c, an entry of "no" in item 19.

15a (General Value to the Service) then he or she can enter a new evaluation here. The RO also has to add remarks in the space provided if he or she does not concur with the RS and marks the fourth comment, or believes that there is inconsistency between Section B and C remarks of the RS. The RO also write comments if accelerated promotion is recommended for the Marine.

2. Performance Evaluation System After 1999

The current performance evaluation system in effect since January 1999 was designed to remedy inflated grading that could not be prevented by subsequent minor adjustments to the prior fitness report, and "reset the system by introducing a new performance evaluation tool" (Hosek et al., 2001, p. 18). A copy of the new fitness report is contained in Appendix B.

To ensure a realistic evaluation of Marines the new PES assigns the responsibility of a fair evaluation system to each of the three persons involved in the fitness report. Firstly, reporting seniors are cautioned by including the following instruction under RS's role: "Inflated markings, patronizing comments, and other techniques designed to game the system and give the MRO an undeserved advantage over contemporaries are acts of misplaced loyalty and ultimately hurt the institution" (MCO P1610.7E, 1998, p. 2-4). Secondly, the RO is held responsible for eliminating inflated report submissions: "ROs will not concur with inflated reports. …ROs will direct RSs to clarify or modify reports that… appear to contain inflated marks…" (MCO P1610.7E, 1998, p.2-5). Finally, the MRO is given a responsibility of maintaining accurate fitreps, by adding a new performance trait to the format that measures the extent to which an officer, as a reporting official, conducted or required others to conduct accurate and timely evaluations (Appendix B Fitness report, Section H).

The new fitness report system keeps intact almost all the administrative procedures and standards that guide the preparation and submission of reports. The new format includes a seven-point grade structure, a reduced role for narrative comments, relative value approach to fitness reports, and voids relative comparisons among peers by the RS. The following paragraphs discuss each section of the new format in Appendix B.

The new format facilitates documentation of critical information under 12 subtopics; A through L. Section A includes administrative information as the prior format did. Items 12, 17, 19 that took place in evaluative traits section B of the old format is incorporated in section A as items 5, 6 and 7. However, there is an important difference between the two formats on the meaning of the "Adverse" option. "Adverse," as used in item 17 of the old report was meant to show that adverse material or incident reports were received by the RS during the reporting period from outside the reporting chain. Item 6 (that corresponds to item 17 of the old format) uses "derogatory material" option for this purpose. "Adverse" as an option under item 5 of the new report is an easy way of showing that the contents of the report constitute an adverse evaluation of the MRO, which gives him/her the right to write statements to argue against the evaluation. In the old report, Marines were supposed to check all marks and comments on themselves to decide if there was anything that made the report adverse.

Section B includes billet description and scope of duties that form the basis for the evaluation. Section C contains information on what the Marine accomplished during the reporting period. The new PES allows the Marine to provide input via a report called "MRO worksheet." The worksheet allows the MRO to provide a summary of accomplishments that he or she believes to be significant during reporting period.

Sections D through I include 14 attributes that form the cross section of the areas to evaluate officers that the Marine Corps deems most significant. The attributes defined under each section are "Mission Accomplishment, Individual Character, Leadership, Intellect and Wisdom, and Fulfillment of Evaluation Responsibilities. Collectively, these attributes provide a clear picture of the Marine's demonstrated capacities, abilities, and character" (MCO 1610.7E, 1998).

The seven markings of "A" to "H" correspond to three descriptions under each trait to help the RS's reasoning in making the appropriate selection. An "A" grade is the lowest possible and indicates an unsatisfactory evaluation. It renders the entire report adverse. "F" and "G" grades, on the other hand, are the highest possible and express distinguished performance. All three markings demand justification by the RS in the space provided under each section. An unobserved marking is also possible for each trait

if the reporting period cannot form an accurate assessment. Section H merits special consideration in the new fitness report as its inclusion is aimed to ensure that reporting officials act in accordance with the objectives of PES by submitting accurate, timely and uninflated evaluations. As the last page of Appendix B shows, Section I provides the RS a location for entering mandatory, directed and additional comments that allows a more comprehensive performance and character evaluation. Section J gives the document legal standing and includes signatures of the RS and the Marine. If the report is adverse the Marine may opt for making a statement by adding an addendum page.

Section K is the part that formalizes the reviewing officer's involvement in the report. The RO indicates in item 1 of Section K whether he or she has had sufficient knowledge and observation of the Marine or not. In item 2, the RO expresses an opinion on the RS's evaluation of the Marine by concurring or not concurring with the remarks. Item 3 provides the RO an opportunity to compare the Marine to all Marines of the same grade whose professional abilities are known to the RO. The RO uses a Christmas tree to make such a comparison and puts the Marine into one of the eight possible categories. Again, an unsatisfactory marking by the RO tenders the report adverse.

Reporting senior and reviewing officer profiles and relative value of the reports are some of the novelties introduced by the new PES. A profile is a snapshot of the RS's and RO's rating history, and includes information on the number of reports written, the fitness report averages for each grade, and the highest and lowest averages submitted by the RS and RO. The profiles aid in maintaining the integrity of the Performance Evaluation System and provide an evaluation of the Marines in RS and RO duties. These profiles are kept by HQMC and used to evaluate performance of Marines as RS and RO in terms of submitting accurate, uninflated and timely reports. HQMC uses these profiles to identify RSs whose profiles indicate noncompliance with the objectives of the Performance Evaluation System.

Finally, the relative value of a report reflects how the average of the observed attributes of an individual report compares to both the RS's average and highest value of all reports written by the RS on Marines at the same grade. Relative value is computed by HQMC using 14 attributes (sections D to H) on the report once a reporting senior has

written at least three observed fitreps. Relative values are converted to a scale ranging between 80 and 100 and displayed on the Master Brief Sheets of Marines and kept in their official military personnel files.

E. CHAPTER SUMMARY

A Marine officer's career begins with The Basic School. However, officer accession programs instill military culture, discipline and norms in individuals by varying degrees. Each accession program is unique and acculturates in different lengths and intensity. Although the accession program ends upon the commissioning of a graduate, the program may affect each graduate's entire career.

The promotion system has a highly significant role in the future career of officers. In addition to defining rules for selecting the most qualified officers for higher grades, the promotion system sets the foundation for continuation in the military profession. The Performance Evaluation System is the only tool for the Marine Corps to formally evaluate Marine officers. The new PES is designed to do this job more efficiently and impartially and to reduce grade inflation on officer fitreps.

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III. LITERATURE REVIEW

Prior studies on officer performance have focused on various performance measures. Some studies have examined a set of performance measures that covered an entire period in an officers' career, whereas others have focused on performance measured at one point of time. In this chapter, I will review some of these studies under three Marine officer performance criteria: performance at TBS; retention; and, promotion. Most of these prior studies have used various officer data sets. In the review, I will provide a summary of each study and include information on the focus of the research, the type of data and models used, the dependent and explanatory variables, and the results.

A. PERFORMANCE AT TBS

1. Study by North and Smith (December, 1993)

In 1993, Center for Naval Analysis (CNA) published two studies that examined performance differences between white and minority junior officers. North and Smith looked at completion of Officer Candidate School, the possibility of commissioning, and performance at TBS in their second study (December, 1993). Their first study (November, 1993) is reviewed in the "Promotion" section of this chapter.

North and Smith use a data set compiled from Automated Recruit Management System (ARMS), TBS, and Headquarters Master File (HMF). The merged file includes information on all officer accessions between FY 1988-1991. The sample contains 3,749 records for officers from four fiscal year cohorts. Success at OCS is defined as completion of the course, while TBS overall class rank is used to evaluate success at TBS. The study also analyzes separate TBS class ranks in academics, leadership, and military skills.

The dependent variable, overall class rank at TBS, was standardized for variations in class sizes. The class-standing percentile was included as a continuous variable in some models. Models of success at TBS include explanatory variables in five categories: (1) demographics; (2) educational background; (3) physical fitness and mental aptitude test scores; (4) exposure to the Marine Corps; and, (5) dummy variables for fiscal years.

The fiscal year dummies capture other unobserved factors across years. Exposure to the Marine Corps was modeled by dummy variables for prior enlisted service and officer accession program.

North and Smith applied ordinary least squares (OLS) regression to explain the variation in the dependent variable. The first regression model explained 17 percent of the variation in the overall success at TBS. The results of the study reveal that ECP and USNA graduates are associated with higher overall class rank at TBS (compared to NROTC); the difference in class rank is 13 and seven percentage points for ECP and USNA graduates, respectively. On the other hand, the TBS class standing of OCC and PLC graduates is 10 to 11 percentage points below that of NROTC graduates. Another significant predictor of success is prior Marine experience, which is associated with nine percentage points higher class standing at TBS. "Other service experience" is found to be statistically insignificant. Other significant variables that positively affect overall TBS class rank are SAT score, science and technical college majors, being married, aviation and law program participants. On the other hand, variables that are significantly associated with lower overall TBS success rate are minority status and being female.

2. Study by Finley (2002)

Finley (2002) examines the performance of Naval Academy graduates at TBS and focuses on the effects of different Marine-specific summer training programs required of Naval Academy graduates over time. Finley uses data on 1,655 male graduates from the Naval Academy classes of 1988 to 1999. Like the North and Smith study, overall class rank percentile is used as the dependent variable.

Although the study focuses on USNA graduates only, it provides insight into the determinants of success at TBS. In his models, Finley includes demographic variables (age, race), academic background (academic major, Naval Academy order of merit), exposure to Marine Corps (prior enlisted service, whether parents served in the military or the Marine Corps), and other USNA-specific background characteristics as explanatory variables.

The OLS regression models explain 39 to 43 percent of the variation in the TBS class rank. In the first model, which adds order of merit to other covariates, officers with

Marine prior enlisted service, technical major and higher order of merit percentiles are found to have higher probabilities of success at TBS. Finley finds that prior Marine Corps enlisted service is a strong predictor in both of his TBS performance models and prior enlisted Marines have 10.5 percentile points higher overall class ranking at TBS. Being in any minority group or having non-Marine prior enlisted service are associated with lower TBS class standing.

B. RETENTION

Retention is defined as an individual officer's voluntary decision to remain on active duty beyond his/her initial service obligation. Retention is a common success measure to evaluate the effectiveness of officer accession programs. The literature shows that commissioning source is a significant predictor of retention in the Marine Corps. Prior researchers have included retention models in their studies for two purposes: (1) as a success measure in officer career; and, (2) to correct for sample selection bias in promotion models.

As a success measure, retention relates to human capital investment by the military: the longer an officer stays in the service, the greater the return on precommissioning training investments by the military. Since one goal is to increase the quality of the officer corps while reducing accession costs, it is critical to find the determinants of retention behavior. In such studies, retention is measured at certain points of an officer's career; however, the point is to predict voluntary decisions. Hence, these studies remove from the sample all officers who leave for involuntary reasons such as for not being selected for augmentation or promotion to junior ranks, for failing basic professional courses or for health problems.

On the other hand, sample selection bias is an issue in models of promotion to O-4 or higher. Sample selection bias occurs if the officers who leave before a promotion board are not a random sample of the original cohort. Put another way, if the promotion probabilities of those who leave (if they stayed) are more than or less than those of officers who stay, then the promotion model suffers from sample selection bias. To correct for such a problem, two techniques (bivariate probit with sample selection and Heckman two-step procedure) have been used. Both procedures involve a two-step procedure in which the first step involves estimating the determinants of survival.

Different from the retention definition, survival is preferred for such uses, as it does not differentiate between voluntary or involuntary leaving decisions. Survival models are not used to evaluate predicted retention effects of variables like commissioning source, but for the purpose of providing an identifying instrument in the main outcome (promotion) model. (See Wooldridge, 1999, pp. 557- 563). In the following paragraphs, I will review three studies where retention is studied for the first purpose, as a performance measure.

1. Study by Hosek et al. (2001)

In their study "Minority and Gender Differences in Officer Career Progression," Hosek et al. investigate minority and female officers' career development across the four Services. The focus of the study is to detect whether there are differences in accession, retention and promotion among officers in different racial, ethnic and gender groups. The study analyzes career progression as a series of retention and promotion outcomes. Retention models examine retention between O-1 and O-5 ranks. The section below discusses the models of retention to O-3 and O-4. The promotion models in the Hosek et al. study are reviewed below in the "promotion" section of this chapter.

The data set used in the Hosek et al. study includes more than 76,000 officers who were commissioned in all four Services in one of the seven accession fiscal years beginning in 1967 and ending in 1991 (1967, 1970, 1977, 1980, 1983, 1987, 1991). The records for officers in professional occupations like medical, legal, and religious are removed from the file.

Each retention outcome is defined and estimated conditional on survival to each career point. For example, retention during O-3 analyzes only those officers who made O-3. Other than the minority and gender variables, prior enlisted service, military service, accession source and Military Occupational Specialty (MOS) variables are included in retention models. Accession sources are grouped into five major groups: Service Academies, ROTC scholarship, ROTC regular (non-scholarship,) OCS (OCC and PLC are grouped into this variable) and direct appointment. The retention model during O-3 analyzes 25,028 officers from the 1977 and 1980 cohorts, whereas the sample size falls to 17,556 in analyzing retention during O-4 for officers from the FY 1967, 1970 and, 1977 cohorts.

In general, the retention models reveal that black male or female officers are more likely to stay in the service compared to white male officers except for retention at O-4, whereas white women are less likely to stay in the service compared to white male officers. The retention models reveal inconsistent outcomes at O-3 and O-4 grades in terms of the effects of accession source. At O-3, officers from ROTC non-scholarship program have the highest retention probability compared to Service Academies. Surprisingly, the O-3 retention model reveals that the four accession programs are positively associated with retention compared to Service Academies with the declining order of magnitude as follows: (1) ROTC regular; (2) Direct Appointment; (3) OCS; and, (4) ROTC scholarship.

The O-4 retention model reveals that officers commissioned via ROTC regular or scholarship options are three to six percentage points more likely than Academy graduates to remain in service until the lieutenant colonel (O-5) promotion board. Other commissioning programs were negatively associated with retention during O-4 grade compared to Service Academies.

Since the data set included observations from the four Services, the models included Service dummy variables. The Marine Corps is negatively associated with retention compared to Army in both retention models. In the O-3 retention model, the predicted retention rate for the Marine Corps is estimated to be the lowest among the four services. The coefficient for the Marine Corps is again negative in the O-4 retention model, but it is not statistically significant. Another significant predictor of retention at both ranks is prior enlisted service. However, the O-3 retention model reveals that officers with prior enlisted service are 14 percentage points more likely to stay compared to peers with no prior service, whereas the O-4 retention model finds that these officers are 16 percentage points less likely to stay in service until the O-5 promotion board. The finding is not surprising when we consider that most of these officers reach the eligibility for retirement after making O-4.

2. Study by North and Goldhaber (1995)

This CNA study examined the extent and causes of racial-ethnic and gender differences in success throughout the careers of Marine officers. North and Goldhaber analyze three measures of success in a Marine officer's career: (1) augmentation; (2)

promotion; and (3) retention. The retention models will be reviewed in the following paragraphs, while promotion to O-4 and O-5 models will be summarized in the promotion section of this chapter. The study uses an HMF longitudinal data file that is created by merging HMF file with TBS file and adding information from FY 1987 through 1993 augmentation and promotion boards.

To analyze retention, two models are used: retention to seven years of commissioned service (YCS) and retention from 7 YCS to 11 YCS. Again, officers who left involuntarily because of non-selection for promotion or augmentation are excluded from the sample. 2,818 observations from FY 1985-1987 cohorts are used in the retention to 7 YCS model, while 2,396 records are used in the 7 to 11 YCS retention model for FY 1980-1983 cohorts.

The dependent variable in the retention models is a dichotomous variable (1 if the officer voluntarily survives, 0 otherwise,) and logistic regression is used in the statistical analysis. Although the study focuses on minority and gender variables, marital status, physical fitness test score, GCT score, three performance measures at TBS (leadership, military, and academic class rank percentiles), college major MOS type, prior military service, and commissioning source (USNA, NROTC, OCC, PLC, MECEP, and ECP) are other covariates in the retention models.

The survival to 7 YCS model explains 33 percent of the variation in retention and shows that "… significant differences in retention are not by racial background or gender, but by commissioning source, occupational type, marital status, GCT score, and TBS leadership class rank" (North and Goldhaber, 1995, p. 52). The regression estimates also show that nearly all officers from the Naval Academy, NROTC and ECP voluntarily survive to 7 YCS. On the other hand, only about 80 percent of MECEP officers and fewer than 70 percent of OCC and PLC officers survive to the same point.

The 7 to 11 YCS retention model explains 12 percent of the variation in the dependent variable, and reveals that male officers are 20 percent more likely to remain than female officers. Other variables that are positively associated with survival are TBS leadership class rank, MOS type and two commissioning programs. The results reveal that of the officers who stayed to 7 YCS point, those from MECEP and OCC are more

than 10 percentage points more likely to remain in service to 11 YCS compared to those from USNA. The model estimates no significant difference between USNA and the other three commissioning sources (NROTC, ECP, and PLC.) Finally, the results of both models indicate that TBS leadership class rank percentile is a very strong predictor of retention, whereas TBS academic and military skills class rank percentile variables do not explain retention significantly. The predicted retention rate to 7 YCS for Marines having the lowest TBS leadership class rank percentile is 15 percentage points less than those who rank at the top of their class. The difference between the same groups is 13 percentage points for retention to 11 YCS.

3. Study by O'Brien (2002)

O'Brien examines the Marine Corps officer accession programs and analyzes their impact on retention in his thesis. He looks at two milestones during careers of officer: (1) retention to the 10th year of service and (2) retention until retirement eligibility. O'Brien uses the Marine Corps Commissioned Officer Accession Career (MCCOAC) data file for his quantitative analysis. The study analyzes 5,712 male Marine officers from FY 1980, 1983, 1986, and 1989 TBS cohorts in the 10-year retention analysis. Women and MCP participant officers are excluded because of their insufficient sample sizes. Explanatory variables are grouped under four categories: demographic, TBS, commissioning source, and service background information.

Using logistic regression techniques, O'Brien finds that four of the six accession programs, marital status, MOS group, and TBS graduation group (TBS thirds) are statistically significant in explaining officer retention until 10th year of service. The regression estimates indicate that the PLC and OCC programs are negatively associated with 10-year officer retention, whereas the MECEP program has a positive and significant association with retention (compared to USNA).

The study validates the North and Goldhaber study (1995) by indicating the importance of TBS performance on officer retention. The 10-year retention model results show that Marines who graduate in the top third group of their classes at TBS are more likely to stay until both the 10th year and the retirement eligibility point compared to the middle third group of officers. Finally, married officers and officers in the combat MOS

group are more likely to stay to 10 YCS than those who are not married and those in the combat service support group, respectively.

C. PROMOTION

Many prior researches have studied officer promotion in the military as a conventional measure of performance. In such studies, the dependent variable is usually a binary variable that equals 1 if the individual officer is promoted to the grade the study analyzes.[9] Depending on the size of the data file, promotion to O-2 through O-6 grades has been included in promotion models, although O-3, O-4, and O-5 promotion models are the most common. Promotion models have included a vast array of variables on the right hand side of the equations. However, focus variables normally include one of the following three: (1) minority or gender; (2) postgraduate education; (3) performance evaluation scores. All studies, on the other hand, have included prior enlisted service and officer accession programs to incorporate the degree of military exposure into the models. This section reviews prior promotion studies that use one of the focus variables listed above.

1. Study by North and Smith (November, 1993)

The first study that focuses on minority and gender variables in promotion models is the North and Smith (1993) study introduced under the "Performance at TBS" section of this chapter. The authors used the TBS longitudinal file that includes records of FY 1980 through 1991 officer cohorts. The data file was merged with Marine Corps FY 1984-1993 captain and FY 1992-1993 major promotion board results that included officers who were in-zone for promotion to O-3 and O-4.

The promotion models include demographic characteristics (race, gender, age and marital status at accession, GCT score, engineering college major, years of service, prior military service), MOS type (four groups), accession sources (USNA, NROTC, PLC/OCC, MECEP, ECP, other sources) and promotion board year information as

[9] In the literature, the promotion variable is generally defined in two different ways depending on the data set collected by the researchers. The first definition is via use of in-zone promotion board results and dependent variable 'select' is assigned 1 if the individual is promoted from the in-zone population. These studies omit above- or below-zone promotions which, the researchers find, do not bias the coefficients. The second group uses longitudinal data sets and defines promotion looking at the separation data file or the latest current record in HMF at the data collection date. Then, the 'select' or 'promote' dependent variable is assigned 1 if the individual officer has promoted to the relevant grade.

explanatory variables. The O-3 promotion model analyzes 10,836 officers, while 1094 records were used for the O-4 promotion analysis.

The O-3 promotion model results show that USNA has the largest positive effect on promotion; NROTC, and ECP follow USNA as the middle group; PLC/OCC, MECEP and other accession sources have the lowest promotion rates. The O-4 promotion model reveals somewhat similar results: PLC/OCC and ECP are associated with lower promotion probabilities compared with other four accession sources. The regression results also show that being married at the accession point increases promotion to O-3 and O-4. In both models, GCT score, prior military service (Marine Corps or other service) and gender are found to be insignificant factors in explaining promotion. However, officers from minority groups are estimated to have lower O-3 promotion rates compared to whites, whereas race/ethnicity is insignificant in the O-4 promotion model.

To correct for sample selection bias the authors used a bivariate probit model with sample selection correction. In this technique, the first equation explains survival to be in zone for promotion to each grade (O-3 or O-4). Then, the 'rho' factor derived from the survival models is included in the promotion models; 'rho' estimates the correlation between the error terms in the survival and promotion models. The estimated rho term is significant and positive in both models, indicating that the results of single-stage probit promotion models to captain and major would provide biased results. A positive rho term also shows that officers who did not stay to the promotion point would have a lower predicted promotion rate had they remained in service.

2. Study by North and Goldhaber (1995)

In the promotion models of their study, North and Goldhaber analyze promotion to captain, major and lieutenant colonel promotion board results for FY 1987 through 1993 (for promotion to major they used the FY 1989-1993 board results). For the purpose of this study, I will review the promotion models for major and lieutenant colonel.

The promotion to major (O-4) model includes 2,894 observations for officers commissioned between FY 1977 and 1982 who were considered in-zone at the FY 1989 through 1993 O-4 promotion boards. The model includes personal characteristics (race, gender, FCT score, marital status at 10 YCS, prior enlisted service,) commissioning

source (USNA, NROTC, PLC, OCC, MECEP, ECP, other commissioning source), academic and leadership class rank percentiles, MOS type group, and whether the officer's occupation is in short supply (as stated in the precept for the promotion board). The authors use both simple probit and bivariate probit (with sample selection) to estimate promotion.

The models explain six percent of the variation in promotion to major variable. Three factors are founds to be significant predictors of promotion: racial-ethnic background, TBS leadership class rank percentile, and MOS type. The models reveal that TBS leadership performance is the most important predictor of promotion to major. The predicted promotion probability of a captain with the highest leadership percentile is 35 percentage points higher than a captain with the lowest percentile. The predicted promotion probability between the top and bottom performers in academics is 10 percentage points. The only significant accession sources are ECP and "other sources," which are negatively associated with promotion (compared to USNA). However, after controlling for commissioning sources, prior military service is not significant. Black officers are less likely to be promoted, all else equal. Married officers at 10 years of commissioned service are more likely to be promoted. Finally, the rho term is not significant in the bivariate probit model, indicating that there is no sample selection bias in simple probit coefficients.

The O-5 promotion (lieutenant colonel) model analyzes 1,769 individuals from FY 1971 through late 1970s. Simple probit regression is used because of missing information at the accession point. The model explains 10 % of the variation in promotion to lieutenant colonel. Including the same variables used in the major promotion model, the simple probit regression reveals that two types of variables have a significant impact on promotion to O-5. First, as in the major promotion model, TBS performance, especially leadership class rank percentile, positively and significantly impacts promotion to O-5 probability. Second, all commissioning sources, except NROTC, are negatively associated with promotion compared to USNA. Officers from the Naval Academy and NROTC have predicted promotion rates that are 30 percentage points higher than those from ECP and more than 40 percentage points higher than officers from MECEP. Officers with prior military service who graduated from MECEP

and ECP programs may be eligible for retirement at this point. The authors comment that this may lower these officers' motivation or it may affect the promotion board members' decision. Unlike the O-4 promotion results, race and gender variables are not significant in the O-5 promotion model.

The authors conclude that after controlling for officer characteristics, occupation, and commissioning source, many of the differences related to race disappear. Only "other" minorities (other than Black and Hispanic) have significantly lower augmentation rates compared to whites. Both blacks and other minorities have lower O-3 promotion probabilities, and blacks have lower O-4 promotion probabilities. The study finds no statistical differences between minority and majority groups in promotion to lieutenant colonel or in retention.

3. Study by Hosek et al. (2001)

The retention models of the study by Hosek et. al were introduced above in the retention section. The promotion models of the study examine promotion to O-2 through O-6 using a joint data file (including the four Services). The O-4 and O-5 promotion models are reviewed below.

Promotion models include minority and gender variables, prior enlisted service, service branch (Army, Navy, Air Force, Marine Corps), accession source (Service Academies, ROTC scholarship, ROTC regular (non-scholarship), OCS, and direct appointment), and MOS dummy variables. The O-4 promotion model analyzes 16,176 individuals from FY 1977 and 1980 cohorts. The logistic regression estimates of O-4 promotion shows that all accession sources are negatively associated with promotion probabilities compared to service academies, all else being constant. However, the coefficient for ROTC scholarship is not significant, meaning that there is no significant difference between ROTC scholarship and academy graduates. On the other hand, OCS (includes OCC and PLC in the study) has the highest negative coefficient, and the predicted promotion rates for OCS graduates is almost 10 percentage points less than officers from the service academies. Minorities, the FY 1980 cohort, engineering and administration MOS groups are other variables that have lower promotion probabilities in the O-4 promotion model. Prior enlisted service and the Marine Corps are not statistically significant.

The O-5 promotion model analyzes 10,619 officers from FY 1967 and FY 1970 cohorts. The logistic regression estimates find results in terms of the signs and significance of the explanatory variables that are similar to the O-4 promotion model. Again, except for the NROTC scholarship program, the other three accession sources in the model are negatively associated with promotion to O-5 compared to service academies. Graduates of OCS and direct commissioning programs have a 15 percentage points lower predicted promotion probabilities to O-5 compared to service academies, all else equal. The results also show that officers with prior enlisted service, black officers, and officers with engineering and administration MOSs are less likely to be promoted to O-5.

Having focused on minority and gender differences in the military services, the study concludes that after controlling for prior enlisted service, accession program, MOS type, military service and cohort group, black men and women are more likely to stay in the service between promotions, but are less likely to be promoted throughout their careers.

The following four studies also examined officer promotion in the Marine Corps. Unlike the CNA and RAND studies, though, these studies evaluate only promotion as a performance measure at certain career points, rather than throughout the career. However, common to all four studies is the inclusion of an index derived from fitness report records of officers. The definition of the Performance Index (PI) varies among the studies, but its inclusion as an explanatory variable in promotion models generally improves the significance of other variables.

In his "Analysis of Promotion Data for Junior Navy and Marine Corps Officers," Mehay (1995) studies various indicators of early career experiences and performance for junior Navy and Marine Corps officers. The study focuses on Unrestricted Line (URL) Navy officer communities and on differences between minority and majority officers. In the Marine Corps promotion analysis, the author analyzes promotion to O-4 using a data file consisting of Marine Corps O-4 promotion board results for FY 1993 and 1994. The promotion data file is then merged with OMF and master brief sheet data file to incorporate personal information and performance evaluations.

The USMC promotion model includes minority status, postgraduate degree, personal decorations, commissioning type (reserve or regular), accession source (USNA, NROTC, OCS, MECEP), the Performance Index (PI), MOS type, and GCT scores as explanatory variables. Mehay creates a Performance Index using the master brief sheet record, which provides a summary of a Marine's performance evaluation records and is used in the personnel management process. Seven performance traits under section B, item 13 of performance characteristics, and 14 quality blocks under section B, item 14 of professional qualities in fitness report are assigned values from a low of 1 to a high of 6. Total scores of item 13 and 14 are divided by the number of observed marks, and one score for each quality measure (13 and 14) is obtained. Summing these two scores provides the performance index score, which ranges from 1 to 12. The Performance Index is broken into three groups to show top, medium, and low performance groups, and then incorporated into the promotion model as three binary variables. Another performance indicator, number of personal decorations, is derived from Master Brief Sheet records.

Using 1,477 observations, the probit promotion model reveals that inclusion of performance evaluations into the promotion model renders black and USNA commissioning program binary variables insignificant, which are significant before such inclusion. Performance Index coefficients show consistent and significant positive effect on promotion. Mehay indicates the role of indirect association between minority and performance index. Cautioning that the result is based on promotion to one grade, and includes promotion outcomes for only two years, Mehay explains this indirect association

> …lower promotion outcome is due almost entirely to these differences in background characteristics, such as GCT scores, or to prior performance, such as the fitness report performance index, rather than to differences associated directly with race (Mehay, 1995, p. 27) .

Using another model for Navy URL officers that includes a similar Performance Index as a dependent variable, he shows that the negative association between minority and performance index is significant even after adjusting for other background variables (GPA, technical major, MOS Type.) He concludes that promotion models that omit variables correlated with minority status (but that include minority variables) will suffer

from omitted variable bias. In such cases, since the correlation between minority status and performance index is negative, the coefficients of the minority variable will be biased downward.

Estridge (1995) focuses on the effect of postgraduate education from Naval Postgraduate School (NPS) on promotion to major and lieutenant colonel in the Marine Corps. He merges Marine Corps FY 1993 and 1994 O-4 and O-5 promotion board data with OMF and master brief sheet data. "Captains in-zone for promotion to O-4 data file" includes 1,521 records, whereas "majors in-zone for promotion to O-5 data set" has 1,453 records.

As defined in the CNA study (November, 1993), Estridge assigns the "promoted" variable 1 if the individual was promoted in the in-zone group and omits below- and above-zone promotions. Multivariate logistic regression is used to examine the impact of graduate education at NPS, and includes gender, race, commissioning type, commissioning source, MOS type, GCT score, awards, performance index and graduate education as explanatory variables. He uses a performance index incorporating performance and quality marks from fitreps, as Mehay does, in which he categorizes officers into high, medium and low performance groups.

The results of the regression models show that the Performance Index, GCT score, personal decorations, pilot and service support MOS types, and regular commissions all positively impact promotion to O-4. NPS graduates have promotion rates that are 15 percentage points higher than non-NPS graduates. In terms of accession sources, USNA is positively associated with promotion compared to OCC/PLC programs, while NROTC and other commissioning sources are negatively associated.

The O-5 promotion models delineate similar results in terms of performance index, NPS graduates, and rewards. NPS graduates have a six-percentage point greater likelihood of selection to O-5 than other majors who did not graduate from NPS. In addition to USNA, NROTC graduates also have higher promotion probabilities to O-5 compared to OCC/PLC graduates. However, the regression models that do not include the Performance Index variable show conflicting results. In these models, Estridge finds that OCC/PLC is correlated with higher promotion rates compared to USNA, NROTC,

and other sources, which is exactly opposite to what Mehay's O-4 promotion model finds. The promotion to O-5 model also finds that the differences between accession programs increase after the Performance Index is omitted from the model.[10] However, in both models the Performance Index variables yield consistent and significant coefficients. Estridge asserts that the strongest and most consistent indicator of selection is above-average performance.

Lastly, the studies by Wielsma (1996) and Branigan (2001) attempted to analyze the factors associated with promotion to O-4 and O-5, respectively. Focusing on the effect of graduate education like Estridge, both studies include a Performance Index into their promotion models, although the way PI is created is different in the two studies. Also, both studies acknowledge the importance of possible sample selection bias in promotion models, and apply statistical techniques to correct it, which was omitted in Estridge study.

Wielsma uses DMDC data merged with Marine Corps fitness report file, HMF, and official military personnel files (OMPF) for 1,087 Marine officers who accessed during FY 1980. He includes explanatory variables under four groups: performance measures - average performance index; cognitive skills - GCT, TBS class rank, graduate degree; affective traits -commissioning source, MOS type, commissioning type; and, demographic traits - age at entry, race, gender, and military skills. The Performance Index definition differs from that in the Mehay and Estridge studies in two ways. First, in addition to 21 professional characteristics in section B of fitness report, he includes item 15 grades on "General Value to the Service." Second, he uses a different scale to convert performance markings into numeric values. The individual scores of the 22 quality markings are summed, and the total is divided by the number of observed marks to obtain an average performance score that ranges between 0 to 9.

Wielsma uses the Heckman two-stage regression technique to correct possible sample selection bias. In the first stage of Heckman procedure, he uses a simple probit model to analyze retention to O-4 promotion board point for 1,087 officers representing all accessions in FY1980 cohort. In the second stage, he uses OLS regression keeping

[10] Also, note that Estridge does not include standard errors or t-statistics of regression coefficients.

only 455 individuals who remained in service till the promotion board convening date. He includes all variables from the first stage retention model except for the unemployment rate, which serves as an instrumental variable. The Inverse Mills ratio is derived from the retention model and included in the promotion model (See Wooldridge 1999, p. 561).

The results of the OLS second stage promotion model show that ROTC, USNA and enlisted commissioning program graduates are less likely to be promoted than PLC program graduates. The model also finds a confounding negative coefficient for a graduate degree, marital status, and average performance index variables, which means married officers, officers with graduate degree or a higher performance index are less likely to be promoted to O-4. The sign of the inverse Mills ratio is negative, and it is statistically significant. This suggests that officers leaving before O-4 promotion board point have lower promotion probabilities, and do not constitute a random sample of surviving officers.

Finally, Branigan (2001) conducts a study similar to Wielsma's, but he analyzes promotion to O-5. He uses Marine Corps FY 1998-2001 O-5 promotion board results for 1,627 Marine officers commissioned in FY 1980 through 1984. The size of the entry cohort is 6,507. To address sample selection bias in the promotion model Branigan uses both the two-stage Heckman procedure and the bivariate probit model with sample selection. He uses the same categorization for explanatory variables as Wilesma; however, he groups all accession sources into only three categories: USNA, NROTC, and others. The performance index is defined similar to that in the Wielsma study, but he uses 21 performance and leadership trait grades from fitreps received at the ranks of O-1 through O-3.

In the first stages of the two-step models, Branigan includes the unemployment rate as an instrumental variable. The dependent variable in these models is either graduate education or survival to O-5 promotion point (at roughly 16 years of service) and sample size is 6,507. In the second stage, he estimates promotion probabilities for 1,627 surviving officers, incorporating the "rho" or the "inverse Mills ratio" variables from the first stage models.

The results of his bivariate probit model with sample selection for the joint probability of survival and promotion show that graduate degree, personal awards, performance index, commissioning age, and aviation related MOSs are significant variables that positively impact promotion to O-5, whereas the effect of being male is negative. The results of the model do not find any significant difference among the three accession sources.

D. CHAPTER SUMMARY

The literature review finds that different performance measures are used to evaluate officer career development. Of these measures, performance at TBS, retention and promotion are conventional success measures used widely by previous researchers. On the other hand, prior studies have focused on one of the three explanatory variables in their models: minority and gender, graduate education, performance index. The professional research institutes, like CNA or RAND, have generally studied the effects of gender and minority variables on the selected performance criteria, whereas individual researchers chose graduate education or the performance index as focus variables. In almost all studies, however, prior enlisted service and officer accession programs have been consistently included in models to reflect the effects of military acculturation.

The literature finds that performance at TBS is a very significant predictor of both retention and promotion of Marine officers. The only study that examines TBS performance where all accession programs are included is by North and Smith (December, 1993). They find that ECP and USNA are the two accession sources that positively impact success at TBS. Prior Marine Corps enlisted experience is the other predictor of success, which is positively associated with higher overall success rates.

In terms of retention and promotion success factors, the results of prior regression estimates do not favor any specific accession program consistently. It is also noteworthy to say that retention is measured at different times of an officer's career; hence, comparing outcomes is not possible. However, the literature finds strong and positive correlation between success at TBS and later retention. As the North and Goldhaber study (1995) explains, overall leadership GPA is an important predictor of retention. Another important predictor of retention is prior enlisted service. Officers with prior enlisted experience are more likely to stay until the retirement eligibility point, which entails at

least 10 years of service as an officer. Prior service impacts retention behavior negatively after this point, which corresponds to retention to lieutenant colonel board.

Finally, promotion models reveal that accession program and TBS performance are significant promotion determinants. Some studies favor USNA and NROTC programs as predictors that positively impact promotion to O-4 and O-5 grades. Adding a Performance Index based on fitness reports into promotion models increase the explanatory power of the models, but may yield inconsistent coefficients for other variables like accession program or graduate degree.

What can be inferred from these studies is that USMC officers having greater military exposure before commissioning are expected to be more successful at TBS. Furthermore, TBS performance is a very strong predictor of retention and promotion, bringing in an indirect effect of military exposure on these career success outcomes. Moreover, a Performance Index based on fitness reports is very significant in explaining retention and promotion. However, no study has studied the effect of military exposure before commissioning on the performance index itself, i.e., using the performance index as a dependent variable.

IV. DATA AND PRELIMINARY ANALYSIS

This chapter describes the data and the samples used in the statistical analyses, provides descriptions of the dependent and explanatory variables used in the models, and presents basic descriptive statistics. The purpose of the preliminary analysis is to evaluate the seven Marine Corps accession programs in terms of five performance measures: performance at TBS; retention to 10 YCS; promotion to O-4 and O-5; and a Performance Index based on officer fitness reports.

A. DATA

The officer career models use three different data sets: (1) the Marine Corps Commissioned Officer Accession Career (MCCOAC) data file; (2) the old fitness report file; and, (3) the new fitness report file. The data sets are merged matching the SSNs of each individual. Some variables that are missing in these files are obtained from DMDC and Marine Corps Headquarters.

1. MCCOAC Data Set

Prepared by CNA, the MCCOAC file is an event-based file derived from longitudinal officer data sets. It includes 28,058 observations from cohorts for FY 1980 through 1999. The cohort size for each fiscal year is presented in Figure 4.1.

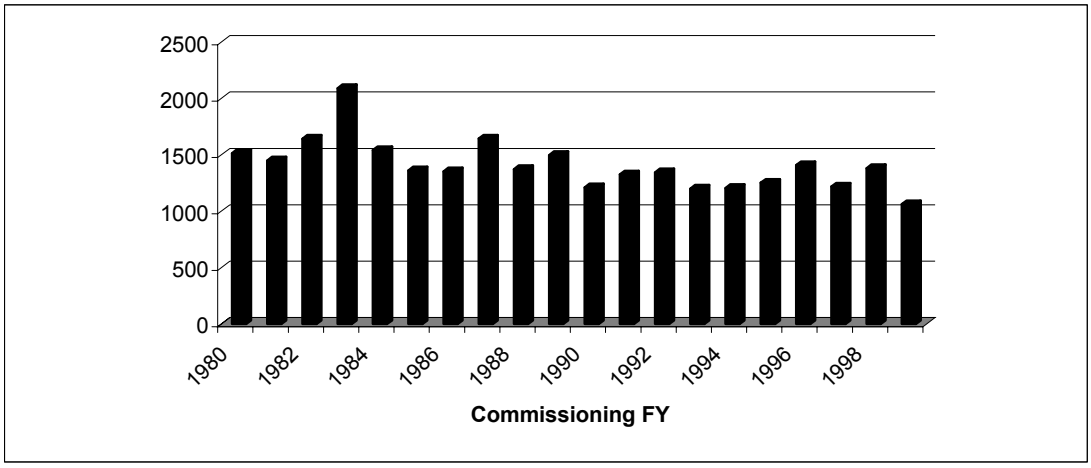

Figure 4.1. Cohort Size by Year.

Information on TBS students contains GPA and class standings for academic, military and leadership performance as well as an overall GPA and class standing. Other

TBS information includes three PMOS preferences by officers at TBS, class size, and TBS fiscal year. Demographic information comes either from the first HMF file when an individual is recorded as an officer or from the last HMF record at an enlisted rank. Segments from HMF file include augmentation and promotion information. Such information provides date of action, reporting unit and monitored command codes, geographic location, and rifle, pistol and PFT qualification. Individual information that may change over time such as marital status, number of dependents, pay grade, and MOS are also updated at augmentation and at each grade between O-1 and O-5. Since the MCCOAC uses HMF to obtain promotion information, promotion records do not include below- and above-zone promotions as well as in-zone promotions. The last HMF records as of 30 September 2000 or separation records from the ARSTAT file provide the last career point at which each individual is observed.

Since CNA could not obtain HMF records before 1985, the MCCOAC file is missing some demographic and accession source information on officers who left the Marine Corps before the first HMF began in 1985. For example, TBS military GPA and class standing information are missing for TBS classes of FY 1980 through 1982 (4,089 observations). However, CNA recovered some of this missing information from another data set (Quester and Hiatt, 2001).

2. Old Fitness Report Data File

The old fitness report file includes information on more than 1.3 million fitness reports submitted between 1951 and 1998. Figure 4.2 presents the distribution of these records across the submission years. The data set includes 48,306 Marine officers in grades O-1 to O-8. The file provides information on reporting senior (RS) markings for the 20 items in section B of fitness report (See Appendix A, Old Fitness Report). Each observation also contains information on the Marine Reported On (MRO), the reporting senior, and the reviewing officer. The average number of fitness reports per officer is 27.

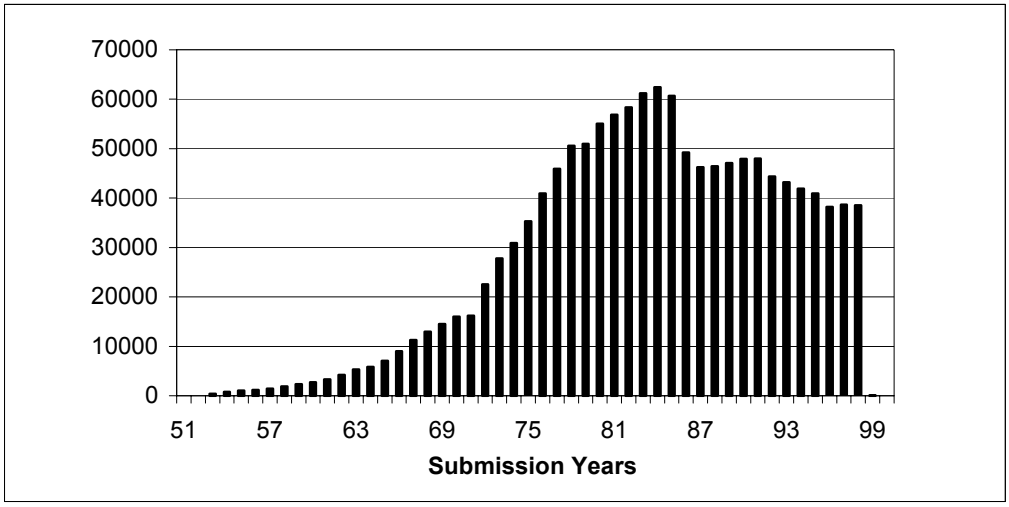

Figure 4.2. The Distribution of Old Fitness Reports Across Years.

3. New Fitness Report Data File

The new fitness report file includes information derived from 52,366 fitness reports submitted between 1998 and 2001. Figure 4.3 presents the distribution of these records across the four submission years. Since the new fitness report was officially in effect after 1999, only 57 new fitreps were submitted in 1998. The end date of the file is August 2001. The file includes fitness report evaluations of the 17,436 Marine officers between O-1 through O-6 grades. It provides reporting senior evaluations on 14 traits in Section D through Section H of the new fitreps. (See Appendix B, New Fitness Report). Each observation also provides information on MRO, RS, and RO. Each officer in the file has approximately three fitness reports.

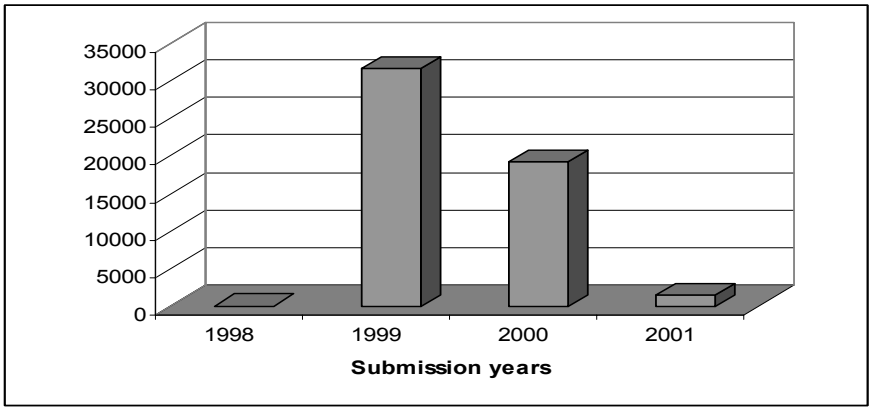

Figure 4.3. The Number of New Fitness Reports Across Years.

B. SAMPLES USED IN STATISTICAL ANALYSIS

Each performance model uses a different officer sample. There are two main reasons why sample sizes differ across models. First, each performance measure examines the officer's career at a different point of time. As of 30 September 2000, some cohorts in the data set had not reached the career stage covered by a given performance measure. For example, while 28,058 observations were available with TBS information, only 6,693 observations were available for analysis at the O-5 promotion point. Figure 4.4 gives a general idea of which cohorts are available for each performance model. Second, not all observations have valid records for all the variables contained in the data set. Therefore, observations with missing values for the variables used in each model are also deleted.

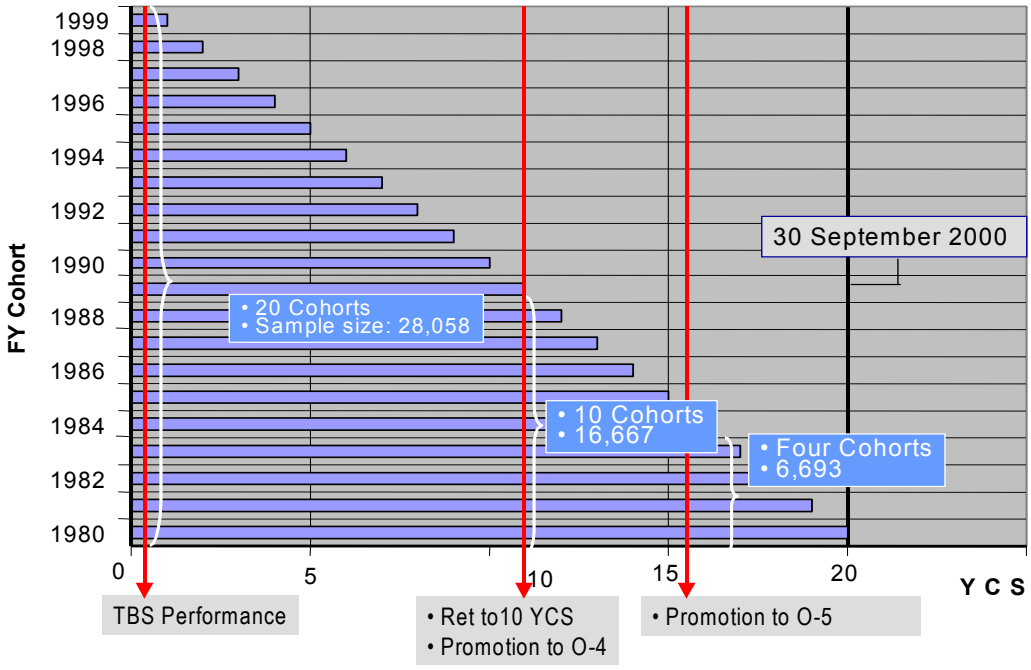

Figure 4.4. YCS by Commissioning FY Cohorts.

Each sample is described below, followed by the introduction of the variables used in the analyses.

1. The Sample for the TBS Performance Model

The analysis of TBS performance uses observations from the 20 cohorts commissioned between 1980 and 1999. The initial sample includes 28,058 observations

for officers who attended TBS during these years. The MCCOAC file categorizes accession programs into eight categories, the eighth being "other accession programs." For the purpose of the study, 72 officers in the "other" category are deleted. As table 4.1 illustrates, 355 observations were deleted because of missing accession source record; 82 observations were deleted because their overall class standing ranks exceeded their class sizes, which presumably is because the officers were set back to the following class. Finally, 17 observations are deleted due to missing values for the other explanatory variables. However, the sample size falls to 23,440 in analyzing TBS Military class rank because 4,403 observations (TBS FY 1980 to 1982 cohorts) are missing military overall class rank information in the MCCOAC file.

Table 4.1. The Sample for TBS Performance Models.

Explanation	**Number**	**Percent of the Entry Cohort**
TBS FY 1980-1999 Cohort	28,058	100.00
- "Other Commissioning Sources" deleted	72	0.26
- Cases missing "Commissioning Source" deleted	355	1.27
- Cases having class standing values greater than the class size deleted	82	0.29
- Cases missing other data used in the models deleted.	17	0.06
The analysis sample size	**27,532**	98.13

2. The Sample for the 10 YCS Retention Model

The 10 YCS retention model analyzes officers who accessed between FY 1980 and 1990. Table 4.2 explains the steps taken to create the analysis data set. The initial sample consists of 16,667 cases. First, 320 observations are deleted because they are either missing commissioning source data or graduated from 'other sources; 8,649 observations left the military before reaching the 120 months of commissioning service point. Since retention is defined as "the voluntary survival behavior of an individual officer after initial service obligation," 2,609 officers who left involuntarily because of health problems, failure in basic training, or failure of promotion to O-2 and O-3 are deleted. The 34 observations with class ranks greater than the class sizes and five observations from the MCP program are deleted, as are 478 observations with missing information for some explanatory variables. The analysis data set contains 13,222 observations.

Table 4.2. The Sample for the 10 YCS Retention Model.

Explanation	Number	Percent of the Entry Cohort
FY 1980-1990 Cohort	16,667	100.00
- Cases missing "Commissioning Source" deleted	320	1.92
- Officers who left involuntarily deleted	2,609	15.65
- Cases having class standing values greater than the class size deleted.	34	0.20
- Insufficient number of MCP participants deleted	5	0.03
- Cases missing other data used in the models deleted	478	2.87
The analysis sample size	**13,222**	79.32

3. The Sample for the O-4 Promotion Model

The promotion to O-4 analysis includes the same 11 cohorts accessed between FY 1980 and 1990 that were used in the retention sample. Table 4.3 explains the observations deleted from the original sample. 320 observations were deleted due to missing commissioning source data, as were 56 observations with class standing values greater than their class sizes, and five officers from the MCP program. After another 661 observations are deleted because of other missing information, the final data set included 15,627 officers who graduated from six accession programs.

The MCCOAC file does not include promotion board results. However, the data set includes "time_O4" variable, which defines the number of months to O-4 date of rank. It is possible to determine the O-4 promotion cycle of each cohort using this variable. Over the years, the promotion time to O-4 fell from 144 months to 113 months. Using "time_O4" for each cohort, time to O-4 board is calculated by subtracting a reasonable period from the time that the first group of each cohort promoted to O-4 (to reflect the time between the convening date of the promotion board and promotion of the first group of officers considered by the board). This calculation shows that 7,281 officers out of 15,627 survived to the O-4 board. Of these 7,281 officers, 5,351 were promoted to O-4, yielding a promotion rate for the entry cohort of 32.11 percent.

Table 4.3. The Sample for the O-4 Promotion Model.

Explanation	Number	Percent of the Entry Cohort
FY 1980-1990 Cohort	16,667	100.00
- Cases missing "Commissioning Source" deleted	320	1.92
- Cases having class standing values greater than the class size deleted.	56	0.34
- Insufficient number of MCP participants omitted	5	0.03
- Cases missing other data used in the models deleted.	661	3.97
The first-step survival analysis sample size	**15,627**	93.76
Officers who survived to O-4 Board	7,281	43.69
The second-step promotion analysis sample size	**7,281**	
Officers who are promoted to O-4	5,351	32.11

4. The Sample for the O-5 Promotion Model

As Figure 4.4 above illustrated, only officers accessed between FY 1980 and 1983 are included in the O-5 promotion analysis. Table 4.4 below explains which observations were deleted from the original sample. The first-step survival analysis sample consists of 5,954 cases. The survivors are calculated in the same way as survivors to the O-4 board, but using the "time_O5" variable. Over the years, time to O-5 promotion fell from 207 months for the FY 1980 cohort to 198 months for the FY 1983 cohort. The calculation yields 1,785 survivors to the O-5 promotion board. Of these, 1,206 Marines are promoted to O-5. The overall promotion rate is 18.02 percent for the entry cohort.

Table 4.4. The Sample for the O-5 Promotion Model.

Explanation	Number	Percent of the Entry Cohort
FY 1980-1983 Cohort	6,693	100.00
- Cases missing "Commissioning Source" deleted	290	4.33
- Cases having class standing values greater than the class size deleted.	49	0.73
- Insufficient number of MCP participants omitted	5	0.0075
- Cases missing other data used in the models deleted.	408	6.10
The first-step survival analysis sample size	**5,954**	88.96
Officers who survived to O-5 Board	1,785	26.67
The second-step promotion analysis sample size	**1,785**	
Officers who are promoted to O-5	1,206	18.02

5. The Samples for the Performance Index (PI) Models

Since the old and the new fitness reports are different in terms of both the traits used in evaluations and the grading scale, two different indexes are created. The creation of the Performance Index variable is explained in the "variable introduction" section of this chapter. The PI models analyze fitreps received at each grade from second lieutenant (O1) through major (O4), because higher-ranking officers are expected to have better fitreps. Table 4.5 explains the sample sizes for each model. Each sample includes the officer's Performance Index averages derived from his/her fitness reports at each grade and other explanatory variables that are matched with SSNs.

Table 4.5. The Sample Sizes for the Old Fitrep PI Models.

Explanation	Number	Percent of the Total Cases
O-1 Performance Index Sample		
FY 1980-1997 Cohort size	25,617	100.0
Number of observations matched with observed fitness reports	20,994	81.87
The analysis sample size	19,559	76.35
O-2 Performance Index Sample		
FY 1980-1995 Cohort size	22,992	
Number of officers who made O-2 in FY 1980 –1995 cohorts	22,393	100.00
Number of observations matched with observed fitness reports	22,069	98.47
The analysis sample size	21,261	94.95
O-3 Performance Index Sample		
FY 1980-1990 Cohort size	16,347	
Number of officers who made O-3 in FY 1980 - 1990 cohorts	11,966	100.00
Number of observations matched with observed fitness reports	10,616	88.72
The analysis sample size	10,507	87.81
O-4 Performance Index Model		
FY 1980-1983 Cohort size	6,693	
Number of officers who made O-4 in FY 1980 - 1983 cohorts	2,016	100.00
Number of observations matched with observed fitness reports	1,954	96.92
The analysis sample size	1,950	96.73

The new fitness report data include the majority of the fitreps submitted in 1999 and 2000. It is not possible to create the Performance Index in a way that covers certain periods before any promotion point as is done with the old fitreps. Some cohorts were O-

2 during this period, whereas others were O-5's. Therefore, the new fitrep sample includes observations from all cohorts who were on active duty between 1998 and 2001, and received a performance evaluation via the new fitreps. The models use the average Performance Index at each grade (O-1 through O-4) during this period. Table 4.6 explains the sample size for each model. The analysis sample sizes are fewer than the number of observations matched because of missing records for the explanatory variables used in the models.

Table 4.6. The Sample Sizes for the New Fitrep PI Models.

Explanation	Number	Percent of the Total Cases
O-1Performance Index Sample		
Number of observations having observed O-1 fitreps	2,346	100.00
Number of individuals matched with observed fitness reports	2,151	91.69
The analysis sample size	1,906	81.25
O-2 Performance Index Sample		
Number of observations having observed O-2 fitreps	3,806	100.00
Number of individuals matched with observed fitness reports	3,700	97.22
The analysis sample size	3,527	92.67
O-3 Performance Index Sample		
Number of observations having observed O-3 fitreps	5,798	100.00
Number of individuals matched with observed fitness reports	5,477	94.46
The analysis sample size	5,317	91.70
O-4 Performance Index Model		
Number of observations having observed O-4 fitreps	4,620	100.00
Number of individuals matched with observed fitness reports	4,349	94.13
The analysis sample size	4,311	93.31

C. VARIABLE DESCRIPTIONS

The performance models include one or more dependent variables used in the statistical analysis. For each model, description of the dependent variables is presented separately in the following section. The explanatory variables are discussed as a group in the next section. Depending on the performance measure used, the models will include all or some of the selected explanatory variables.

1. The Dependent Variables

a. The TBS Performance Model

The TBS performance models analyze four different success measures at TBS: overall, academic, military, and leadership class standings. As explained in the TBS section of Chapter II, overall class standing includes the academic, military and leadership evaluation criteria. To adjust for the differences in class size, class-standing percentiles are calculated:

Class Standing Percentile = (1- (Class Standing/ Class Size)) *100

Class standing percentile is a continuous variable with a range between 0 and 100. Higher numbers indicate a higher class standing. Table 4.7 summarizes definitions of the TBS performance variables.

Table 4.7. Dependent Variables Used in the TBS Models.

Variable Description	Variable Name	Variable Type	Range
TBS Overall Class Standing Percentile	TBSperc	Continuous	0-100
TBS Academic Class Standing Percentile	TBSacperc	Continuous	0-100
TBS Military Class Standing Percentile	TBSmilperc	Continuous	0-100
TBS Leadership Class Standing Percentile	TBSleadperc	Continuous	0-100

b. The 10 YCS Retention Model

The dependent variable used in the retention model is a dichotomous variable to represent whether the officer remained in the Marine Corps until the 10th year of service. This variable is obtained using "num_mon" variable in the MCCOAC file, which shows the number of months served since the date of commissioning. As Table 4.8 shows, after omitting the observations that left involuntarily, the "Retained_10YCS" dependent variable equals '1' if the observation has more than 119 months of commissioning service and '0' otherwise.

Table 4.8. Dependent Variables Used in the 10 YCS Retention Model.

Variable Description	Variable Name	Variable Type	Range
Retention to 10 YCS	Retained_10YCS	Binary	= 1 if 'num_mon' $\geq$ 120 = 0 otherwise

c. The O-4 and O-5 Promotion Models

Two major outcomes are analyzed in the probit regression with sample selection models, which involves a two-step procedure. The first is a binary variable for survival to promotion board (O-4 or O-5) and is used in the first stage survival model. As Table 4.9 explains, the dependent variable 'survive' equals 1 if the officer stays long enough to be considered by the relevant promotion board. The second binary variable defines the promotion outcome and is used in the second stage promotion model, which also incorporates a 'rho' term from the first stage model.

Table 4.9. The Dependent Variables Used in the Promotion Models.

Variable Description	Variable Name	Variable Type	Range
Survival to O-4 Board	Survived_O4Brd	Binary	= 1 if 'num_mon' ≥ the earliest 'time_O4' for the FY cohort. = 0 otherwise
Promotion to O-4	Prom_O4	Binary	= 1 if 'time_O-4' ≥ the earliest 'time_O4' for the FY cohort. = 0 otherwise
Survival to O-5 Board	Survived_O5Brd	Binary	= 1 if 'num_mon' ≥ the earliest 'time_O5' for the FY cohort. = 0 otherwise
Promotion to O-5	Prom_O5	Binary	= 1 if 'time_O-5' ≥ the earliest 'time_O5' for the FY cohort. = 0 otherwise

d. The Performance Index (PI)

Two different Performance Indexes are analyzed in the models, one based on the old fitreps, the other based on the new fitreps. Other than the number of traits used in the calculation of the indexes, the creation process follows the same steps for both PI's, as illustrated in Figure 4.5. PI is created using 21 traits in the old fitrep and 14 traits in the new fitrep. First, each marking is given a number depending on the evaluation. Then, all numbers are summed and divided by the number of rated attributes. This gives the PI for one fitrep. Because individuals have more than one fitrep at each grade, average PI for each grade is calculated and finally converted to a scale of 100.

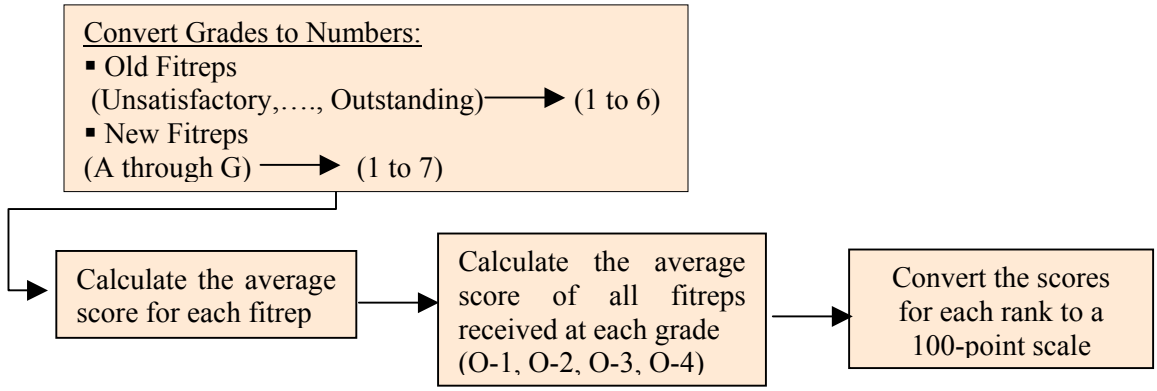

Figure 4.5. Steps in Calculation of Performance Index.

Table 4.10 summarizes the dependent PI variables obtained via the process described in Figure 4.5.

Table 4.10. The Dependent Variables Used in the PI Models.

Variable Description	Variable Name	Variable Type	Range
Performance Index for O-1 Grade (Old Fitrep)	O1PI	Continuous	0-100
Performance Index for O-2 Grade (Old Fitrep)	O2PI	Continuous	0-100
Performance Index for O-3 Grade (Old Fitrep)	O3PI	Continuous	0-100
Performance Index for O-4 Grade (Old Fitrep)	O4PI	Continuous	0-100
Performance Index for O-1 Grade (New Fitrep)	NewO1PI	Continuous	0-100
Performance Index for O-2 Grade (New Fitrep)	NewO2PI	Continuous	0-100
Performance Index for O-3 Grade (New Fitrep)	NewO3PI	Continuous	0-100
Performance Index for O-4 Grade (New Fitrep)	NewO4PI	Continuous	0-100

2. The Explanatory Variables

The explanatory variables used in the performance models are grouped into three distinct categories: personal characteristics; cognitive human capital; and, affective skills. Table 4.11 provides the variable name and description of the variables used in the models. TBS percentiles are also included as the explanatory variables because these variables are later used as explanatory variables in some models.

Table 4.11. Independent Variable Descriptions.

Variable Description	Variable Name	Variable Type	Range
Personal Characteristics			
Marital Status:			
Marital Status at accession	Married_acc	Binary	= 1 if married
Marital Status at O-2 grade	Married_O2		= 0 otherwise
Marital Status at O-3 grade	Married_O3		
Marital Status at O-4 grade	Married_O4		
Ethnicity:			
White	White	Binary	= 1 if white, = 0 otherwise
African American	Africaname		= 1 if African American, = 0 otherwise
Hispanic	Hispanic		= 1 if Hispanic, = 0 otherwise
Other Race	Other		= 1 if Other Race, = 0 otherwise
Gender:			
Female	Female	Binary	= 1 if female = 0 otherwise
Commissioning Age	Comm_age	Continuous	21 - 34
Cognitive Human Capital			
GCT Group:			
Top Third	gcttopthird	Binary	= 1 if in top third GCT group, = 0 otherwise
Middle Third	gctmidthird		= 1 if in middle third GCT group, = 0 otherwise
Bottom Third	gctbotthird		= 1 if in bottom third GCT group, = 0 otherwise
TBS Percentile:			
TBS Overall Class Standing Perc.	TBSperc	Continuous	0 - 100
TBS Academic Class Standing Perc.	TBSacperc		0 - 100
TBS Leadership Class Standing Perc.	TBSmilperc		0 - 100
TBS Military Class Standing Perc.	TBSleadperc		0 - 100
Affective Traits			
Occupational Specialty: [a]			
Combat	COMBAT_MOS	Binary	= 1 if MOS is Combat Arms
Ground Support	GRSUPPORT_MOS		= 1 if MOS is Ground Support
Service	SERVICE_MOS		= 1 if MOS is Service
Aviation	AVIATION_MOS		= 1 if an Aviator
Aviation Support	AVSUPPORT_MOS		= 1 if MOS is Aviation Support
Prior Enlisted Service;			
Prior Enlisted Service	Priorenl	Binary	= 1 if four years active enlisted time; = 0 otherwise

Table 4.11. Independent Variable Descriptions (cont.)

Variable Description	Variable Name	Variable Type	Range
Affective Traits (Cont.)			
Commissioning Source;			
United States Naval Academy	USNA		= 1 if comm. source is USNA
Naval Reserve Officer Training Corps Program	NROTC		= 1 if comm. source is NROTC
Platoon Leaders Course Program	PLC	Binary	= 1 if comm. source is PLC
Officer Candidate Course Program	OCC		= 1 if comm. source is OCC
Marine Enlisted Commissioning Education Program	MECEP		= 1 if comm. source is MECEP
Enlisted Commissioning Program	ECP		= 1 if comm. source is ECP
Meritorious Commissioning Program	MCP		= 1 if comm. source is MCP
Duty Type being reported in fitrep;			
Joint Duty as O-4	Joint_O4	Binary	= 1 if there is at least one observed joint duty fitrep received at O-4 grade
Combat Duty	Combat_O1 Combat_O2 Combat_O3 Combat_O4	Binary	= 1 if there is at least one observed combat-duty fitrep received at each grade
Qualification for Promotion;			
Not recommended for promotion	Nopromote_O1O3	Binary	= 1 if there is at least one fitrep that includes 'not recommended for promotion' marking at grades O-1 through O-3.
	Nopromote_O1O4	Binary	= 1 if there is at least one fitrep that includes 'not recommended for promotion' marking at grades O-1 through O-4.
Recommended for accelerated promotion	Accpromo_O1O3	Binary	= 1 if there is at least one fitrep that includes 'accelerated promotion' recommendation at grades O-1 through O-3.
	Accpromo_O1O4	Binary	= 1 if there is at least one fitrep that includes 'accelerated promotion' recommendation at grades O-1 through O-4.
Fiscal Year Dummy Variables			
Commissioning Fiscal Year Cohort	FRXX	Binary	= 1 for each Commissioning Fiscal Year

[a] See Appendix C for the division of military occupational specialties into the categories.

D. PRELIMINARY ANALYSIS

This section provides basic statistics on the performance measures before developing multivariate models. Each subsection provides the number of observations, the mean, and the standard deviation for all the performance measure variables. For binary variables like 'promotion to O-4' the mean value shows the percentage of observations for which the variable has a value of 1. The tables also include results of analysis of variance (ANOVA) tests that assess differences in means among the accession sources. In all tests, the null hypothesis is that there is no difference in group means. Rejection of the null indicates significant difference in means among the accession sources.

1. TBS Performance

Table 4.12 compares means of the four TBS performance measures. The overall class ranks equal 50 because all of the class ranks are standardized by converting to percentiles. The p-values from the ANOVA tests indicate that the means on the performance measures are significantly different across commissioning sources. Officers commissioned from the three enlisted commissioning programs (MECEP, MCP, and ECP) have significantly higher overall class rank percentiles compared to direct entrants. NROTC and USNA follow these three programs as the middle group, while OCC and PLC program graduates have the lowest class rank of the seven commissioning sources.

Table 4.12. TBS Class Standing Percentile by Commissioning Source.

Variable	N	Mean (Standard Deviation)								P-Value	Signif-icance
		Overall	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP		
Overall Percentile	27,532	50.0 (28.8)	53.5 (28.0)	54.8 (28.1)	47.4 (28.0)	43.5 (28.4)	73.1 (25.7)	57.0 (29.3)	62.7 (29.6)	<0.001	Yes
Academic Percentile	27,529	50.0 (28.9)	54.9 (28.1)	55.7 (28.6)	47.1 (28.1)	43.9 (28.4)	68.7 (26.4)	55.3 (29.1)	59.7 (28.4)	<0.001	Yes
Leadership Percentile	27,532	50.0 (28.8)	50.5 (28.4)	53.1 (28.3)	48.1 (28.1)	45.4 (28.5)	72.7 (26.0)	57.7 (30.3)	63.5 (29.2)	<0.001	Yes
Military Percentile	23,440	50.0 (28.9)	54.6 (28.6)	52.7 (28.7)	48.9 (28.4)	43.9 (28.4)	65.3 (27.3)	52.7 (28.3)	59.4 (29.5)	<0.001	Yes

2. Retention to 10 YCS

Table 4.13 compares mean retention rates among the six commissioning sources. The overall 10-year retention rate is 0.553, indicating that of the 13,222 officers analyzed, 7,305 officers voluntarily remained in service for at least 10 years. The difference in means among the commissioning sources is significant based on the ANOVA test. Almost 73 percent of ECP participants and 86 percent of MECEP participants voluntarily stay in service at least for 10 years. Officers from USNA, NROTC, and PLC have retention rates between 54 and 56 percent. OCC graduates, on the other hand, have the lowest retention rate, 50.3 percent.

Table 4.13. Retention to 10 YCS rates by Commissioning Source.

Commissioning Source	N	Mean	Std. Dev.	F Value	P-Value
Overall	13,222	0.553	0.497		
USNA	1,494	0.562	0.496	50.90	< 0.0001
NROTC	2,841	0.553	0.497		
PLC	5,099	0.537	0.499		
OCC	2,906	0.503	0.50		
MECEP	407	0.860	0.347		
ECP	475	0.728	0.445		

3. Promotion to O-4

Table 4.14 compares O-4 promotion rates among the officer groups from six commissioning sources. The overall promotion rate is 0.735, which means that of the 7,281 officers who stayed in service long enough to be considered by O-4 promotion boards, 5,351 officers promoted. The p-value from ANOVA test reveals that the difference in promotion rates among the groups is significant. Unlike in the previous two performance measures, OCC graduates have the highest promotion rates. In addition, Tukey's test is conducted to find which group is significantly different because the mean values are very close. Tukey's test reveals that the only statistically significant difference in means is between OCC and NROTC.

Table 4.14. O-4 Promotion Rates by Commissioning Source.

Commissioning Source	N	Mean	Std. Dev.	F Value	P- Value
Overall	7,281	0.735	0.441		
USNA	821	0.720	0.431	3.02	< 0.01
NROTC	1,568	0.711	0.453		
PLC	2,762	0.735	0.441		
OCC	1,444	0.771	0.421		
MECEP	348	0.733	0.443		
ECP	338	0.731	0.444		

4. Promotion to O-5

Table 4.15 presents O-5 promotion rates by commissioning source. The overall promotion rate is 0.676, which is based on the 1,206 officers who made O-5 out of 1,785 who remained in service to be considered by O-5 promotion boards. The null hypothesis that mean promotion is the same for all groups is rejected at the 5-percent or better significance levels based on ANOVA test. USNA and NROTC officers have the highest promotion rates at 0.75 and 0.72, respectively. The promotion rates for PLC and OCC graduates are 8-10 percentage points lower than USNA graduates, respectively. MECEP and ECP officers have the lowest promotion rates.

Table 4.15. O-5 Promotion Rates by Commissioning Source.

Commissioning Source	N	Mean	Std. Dev.	F Value	P -Value
Overall	1,785	0.676	0.468		
USNA	182	0.747	0.436	2.40	0.035
NROTC	311	0.717	0.451		
PLC	632	0.671	0.470		
OCC	529	0.652	0.477		
MECEP	34	0.589	0.500		
ECP	97	0.598	0.493		

5. Performance Index (PI)

a. PI Based on Old Fitreps

Table 4.16 includes average PI at O-1 through O-4 grades for the six officer groups, as well as the overall mean PI values. It is worth noting, first, that the old fitreps were highly inflated. All four PI mean values are greater than 96. Second, although the grades are inflated and the distribution of PI is very narrow, the p-values

from the ANOVA tests show that there are still significant differences among the six officer groups.

In the first three samples for grades O-1 through O-3, MECEP (and MCP if observed) graduates have the highest mean PI values. This is consistent with the preliminary results in the TBS and 10-year retention comparisons. However, MECEP graduates have the lowest O4 PI. Officers from the third enlisted commissioning program (ECP) reveal a decreasing performance over the years relative to their performance at TBS. ECP graduates have the third highest mean O-1 PI after MECEP and MCP officers, as in the TBS and retention comparisons. However, ECP officers also fall behind USNA and NROTC graduates after O-1. ECP graduates have the second lowest mean O4 PI before MECEP graduates. Unlike ECP officers, OCC and PLC graduates have the lowest two mean PI scores at O-1 through O-3, similar to their performance at TBS. However, OCC graduates obtain the highest mean O-4 PI after USNA graduates. Surprisingly, in spite of having the lowest O-2 and O-3 PI, OCC graduates' O-4 promotion rate is higher than those of the other five groups. Finally, USNA and NROTC graduates have average PI scores that place them in the middle group –below MECEP, and MCP if observed at grades O-1 through O-3. USNA graduates have the highest mean PI as O-4's.

Table 4.16. Performance Index by Commissioning Source.

Variable	N	Mean (Standard Deviation)								F Value	Prob. Value
		OVERALL	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP		
O1 PI	19,559	96.31 (4.44)	96.70 (4.20)	96.53 (4.02)	95.93 (4.75)	96.13 (4.60)	97.93 (3.16)	96.74 (3.92)	99.54 (0.86)	39.45	< 0.001
O2 PI	21,261	97.58 (3.55)	97.93 (2.85)	97.86 (3.36)	97.37 (3.68)	97.36 (3.77)	98.72 (2.40)	97.46 (3.97)	99.35 (1.48)	29.71	< 0.001
O3 PI	10,507	98.56 (2.75)	98.72 (2.78)	98.83 (2.51)	98.48 (2.70)	98.23 (3.02)	99.09 (2.66)	98.51 (2.73)	-	15.13	< 0.001
O4 PI	1,950	99.71 (0.99)	99.83 (0.75)	99.70 (1.10)	99.67 (1.11)	99.77 (0.66)	99.54 (1.52)	99.55 (1.26)	-	1.99	0.08

b. PI Based on New Fitreps

Table 4.17 includes average PI and standard deviations at O-1 through O-4 grades for the six officer groups, as well as the overall mean PI and standard deviations. Overall PI means and standard deviations at each grade show that PI derived from the new fitreps has a more normal distribution. Average O-2 PI is nearly 49, which is very close to a mean value of 50 in a sample with a range of 0 to 100. In addition, the difference in mean PI's among the commissioning sources is significant at all grades, and the null hypothesis is rejected at 1 % significance level in ANOVA test. Although the average O-1 PI is nearly 18 points lower than O-4 PI, such a an increase over time is expected considering that high-ranking officers undergo a competitive selection process that picks the best qualified ones from each cohort.

MECEP and MCP –when observed– officers are the top performers at O-1 through O-3 grades. ECP graduates fall into the middle group as junior officers; however they have the lowest O-4 PI average. PLC and OCC officers steadily have either the lowest PI averages or one level above the lowest average. NROTC graduates have an increasing trend over years, whereas USNA graduates are the top performers at O-4 grade.

Table 4.17. Performance Index by Commissioning Source.

Variable	N	Mean (Standard Deviation)								F Value	Prob. Value
		OVERALL	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP		
NewO1 PI	1,906	42.87 (8.64)	44.78 (9.15)	43.98 (8.09)	41.29 (8.15)	41.86 (8.63)	45.56 (8.42)	44.01 (8.84)	44.35 (9.00)	9.37	< 0.001
NewO2 PI	3,527	48.55 (9.64)	48.01 (10.0)	49.11 (8.66)	47.10 (9.98)	48.36 (9.26)	51.80 (9.43)	50.51 (9.67)	54.59 (9.41)	16.58	< 0.001
NewO3 PI	5,317	52.78 (10.48)	53.41 (10.5)	54.54 (10.2)	50.97 (10.4)	53.17 (10.3)	56.59 (10.9)	53.68 (10.1)	-	27.07	< 0.001
NewO4 PI	4,311	60.51 (10.82)	62.27 (9.86)	61.07 (11.2)	59.92 (10.8)	60.37 (11.0)	61.01 (9.56)	59.26 (10.6)	-	4.44	0.0005

Since the Marine Corps introduced the new fitness report system in 1999 to combat grade inflation it is instructive to determine if this goal has been met. As Figure 4.3 illustrated above in the data section, there are very few fitreps in the new fitrep data set submitted in 1998 and 2001. Therefore, I had to limit the analysis to two years: 1999 and 2000. For this purpose, the data set is first partitioned into subsets by grades. Then, each subset is further divided into two years. For example, two O-1 PI data sets are created; one contains observed O-1 fitreps submitted in 1999, the other in 2000. The same process is repeated for grades O-2 through O-4.

Two different t-tests are conducted to test differences in means for the two years: the t-test for difference in means in two different samples and the t-test for paired comparisons. The first t-test was performed to compare the PI distribution between two years. Table 4.18 includes grade, year, number of observations, difference in means, and significance level for both tests. The number of observations in the first test (column 3) is greater than the number in the second test (column 6) because some observations received fitreps at one grade in 1999, but did not have a fitrep in 2000, or vice versa. Both tests, however, reveal that the average PI increased in 2000 relative to 1999. For example, the first t-test reveals that the mean O-3 PI in 2000 was 1.65 points higher than that in 1999, whereas the paired t-test finds that PI averages in 2000 were 3.02 points higher than in 1999 for the same 2,103 officers. The results indicate that the new fitness report system is also subject to inflation. Even in two years, the average PI increased between 0.8 and 2.35 percentage points. The new fitrep system may suffer from the inflation like the prior one if the trend continues in the future.

Table 4.18. Difference in Means in PI Over Two Years.

Grade	Difference in means in two samples				Difference in means in paired comparisons		
	Fitrep Year	**N**	**Mean Difference**	**Significance Level (α)**	**N**	**Mean Difference**	**P-Value**
O-1	1999	1,489	1.7	0.05	518	7.26	<0.001
	2000	885					
O-2	1999	2,700	0.8	0.05	748	3.07	<0.001
	2000	1,553					
O-3	1999	4,702	1.65	0.05	2,103	3.02	<0.001
	2000	2,672					
O-4	1999	3,916	2.35	0.05	1,918	2.80	<0.001
	2000	2,294					

E. SUMMARY

This chapter described the three data files used in the analyses: the MCCOAC file; the old fitrep data file; and, the new fitrep data file. 12 different officer samples including sample sizes between 27,532 and 1,783 are used for the five performance models. TBS models analyze overall, academic, military, and leadership class standing percentiles at TBS, while retention and promotion models use dichotomous dependent variables. The fifth model analyzes a Performance Index derived separately from the old and new fitreps. For each fitrep data set –old and new– a different PI is calculated for each grade between O-1 and O-4. Finally, preliminary analysis involves an analysis of variance (ANOVA) to determine if there are significant differences among the six commissioning sources on the five performance measures. In all tests, the null hypothesis (that there is no significant difference in group means) is rejected at the 5-percent or better significance levels (difference in O-4 PI means is significant at the 10-percent level).

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V. MODELS

The previous chapter found significant differences in mean performance levels among commissioning sources. This chapter specifies multivariate models that include other covariates to explain the variation in the five performance variables. All models include dummy variables for each commissioning program, which comprise the focus variables. Other explanatory variables selected from personal characteristics, cognitive human capital and affective traits categories described above in Table 4.11 are included in each specification. Each section justifies the model specification and establishes the hypothesized relationships.

A. PERFORMANCE AT TBS MODEL

1. Model Specification

The TBS model specification is based on variables found to be significant in previous studies (North and Smith, 1993; Finley, 2002). Table 5.1 displays the model specifications used in the OLS regressions. The second model adds GCT information to the first specification. Although GCT scores are missing for 1,551 observations, GCT is included to represent cognitive abilities because the MCCOAC file does not provide SAT scores. North and Smith (1993) differentiate between 'Prior Marine' and 'Prior Other Service' enlisted experience, and finds that the former has a very significant association with success at TBS, whereas the latter is insignificant. However, the prior enlisted service information obtained from Marine Corps Headquarters only shows whether or not each observation has four years of enlisted service before commissioning and does not identify branch of Service. College major codes that North and Smith (1993) find significant in explaining success at TBS are not included since no major code is specified for more than 6,000 observations in the MCCOAC file. Finally, commissioning options represent program types that each commissioning program provides its participants with one of the three MOS codes at TBS: the ground (and other); aviation; and, law MOSs.

Table 5.1. OLS Multivariate Regression Model Specifications for TBS Performance.

1. TBS Overall Class Rank / TBS Academic Class Rank / TBS Military Class Rank / TBS Leadership Class Rank = ***f*** (Marital Status, Commissioning Age, Gender, Ethnicity Group, Commissioning Options, Prior Enlisted Service, Commissioning Source)

2. TBS Overall Class Rank / TBS Academic Class Rank / TBS Military Class Rank / TBS Leadership Class Rank = ***f*** (Marital Status, Commissioning Age, Gender, Ethnicity Group, Commissioning Options, **GCT Thirds,** Prior Enlisted Service, Commissioning Source)

2. Hypothesized Effects of the Explanatory Variables

Table 5.2 lists the explanatory variables and their hypothesized relationship to performance at TBS. The primary assumption is that commissioning programs that provide longer and more intensive pre-commissioning acculturation or that credit enlisted service experience will be associated with better performance. Therefore, OCC and PLC programs are expected to have a negative association with TBS class rank, whereas MECEP, ECP and MCP graduates and those with prior enlisted experience expected to be associated with better performance at TBS (relative to USNA). Married and older officers are more responsible and have more work force experience and, therefore, are expected to be positively associated with performance at TBS. Officers from the aviation and law programs are expected to have higher class ranks at TBS relative to officers in ground or other programs (based on source of entry) because aviation and law programs are highly competitive. Based on previous studies (North and Smith, 1993), individuals from minority groups are not expected to perform well at TBS. Finally, the model also assumes that higher GCT positively affects success at TBS.

Table 5.2. Hypothesized Effects of the Explanatory Variables on TBS Class Rank.

Variable Name	Expected Sign
Personal Characteristics	
Married at Accession	+ (Compared to not married)
Commissioning Age	+
Female	- (Compared to male)
White	Base Ethnicity Group
African American	-
Hispanic	-
Other Race	-

Table 5.2. Hypothesized Effects of the Explanatory Variables on TBS Class Rank (cont.)

Cognitive Human Capital	
Bottom Third	Base GCT third group
Middle Third	+
Top Third	+
Affective Traits	
Ground Option	Base Commissioning Option
Aviation Option	+
Law Option	+
Prior Enlisted Service	+ (Compared to no prior enlisted experience)
USNA	Base Commissioning Source
NROTC	?
PLC	-
OCC	-
MECEP	+
ECP	+
MCP	+

B. 10 YCS RETENTION MODEL

1. Model Specification

The model specification is based on the models used by North and Goldhaber (1995) and Hosek et al. (2001). Table 5.3 summarizes the model specification. The model is estimated as a non-linear logit equation. The second model adds the TBS overall class standing percentile and MOS types to the first specification. The TBS overall class rank is included as it is highly correlated with success rates: "Our most robust finding is that higher TBS leadership class rank is associated with higher success rates, regardless of the measure" (North and Goldhaber, 1995, p. 59). However, rather than leadership percentile, overall class rank percentile is included in the specification. Another variable that prior studies find significant in explaining retention is MOS, and it is also added to the second specification.

Table 5.3. Logit Retention to 10 YCS Model Specifications.

1. Retained_10YCS = ***f*** (Marital Status, Commissioning Age, Gender, Ethnicity Group, Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year)

2. Retained_10YCS = ***f*** (Marital Status, Commissioning Age, Gender, Ethnicity Group, **TBS Overall Class Rank Percentile, MOS Group,** Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year)

2. Hypothesized Effects of the Explanatory Variables

The hypothesized effects of the explanatory variables are the same as in the TBS model except for African American, PLC and OCC variables. Hosek et al. (2001) find that black men and women are more likely to stay voluntarily (compared to white men), hence the sign for African American is positive. Since their accession programs provide shorter pre-commissioning military training, OCC and PLC graduates are assumed to have a lower taste for the military, and are expected to leave earlier. On the other hand, officers from enlisted commissioning programs and prior enlisted officers are expected to have a positive association with retention (see O'Brien, 2002). Finally, the model expects that aviation and aviation support MOSs will be associated with higher retention rates as various incentive pay programs are offered to both MOSs to increase retention. Table 5.4 summarizes the hypothesized effects of the explanatory variables.

Table 5.4. Hypothesized Effects of the Explanatory Variables on 10 YCS Retention.

Variable Name	Expected Sign
Personal Characteristics	
Married at accession	+ (Compared to not married)
Commissioning Age	+
Female	- (Compared to male)
White	Base Ethnicity Group
African American	+
Hispanic	?
Other Race	?
Cognitive Human Capital	
TBS Overall Class Rank Percentile	+
Affective Traits	
Prior Enlisted Service	+ (Compared to no prior enlisted experience)
USNA	Base Commissioning Source
NROTC	?
PLC	-
OCC	-
MECEP	+
ECP	+
MCP	+
Combat MOS	Base MOS Group
Ground Support MOS	?
Service MOS	?
Aviation MOS	+
Aviation Support MOS	+
Commissioning Fiscal Year	?

C. O-4 AND O-5 PROMOTION MODELS

1. Model Specification

The promotion models use both simple probit and 'bivariate probit with sample selection,' as explained in the previous chapter. Bowman and Mehay (1999) use bivariate probit in their "Graduate education and employee performance" study, and focus on the effect of Master's degree on Navy officers' O-4 promotion. To correct for possible sample selection bias in the O-4 promotion models the authors first estimate a probit model to obtain the determinants of graduate school attendance. Bowman and Mehay include sub-specialties, college performance variables (other than GPA), and preference for graduate education as instrumental variables in the first-stage. They explain that "…a large part of the promotion effects in the single-stage models are explained by the selection of more able officers into graduate education program." Similarly, the promotion models below analyze two major outcomes in the bivariate probit, which involves a two-step procedure. The first-stage model estimates survival to promotion board (O-4 or O-5), while the second-stage model analyzes promotion.

The survival model uses a similar specification to the promotion models. However, there are a few differences. First, the explanatory variables in the second-stage promotion model should be a subset of the explanatory variables in the first stage retention model (See Wooldridge, 1999, p. 562). Three variables are used as instrumental variables that are not included in the promotion models: commissioning age; recommendation for accelerated promotion; and, not recommendation for promotion.[11] Put another way, these variables are assumed to be exogenous in the promotion equations. Second, the content of marital status and MOS group variables change slightly. Rather than marital status at accession, marital status at O-3 and O-4 grades are included in the O-4 and O-5 promotion models, respectively. Finally, the promotion models incorporate a 'rho' term obtained from the first stage retention model to estimate the covariance between the error terms in the survival and promotion equations. As in the previous retention model, the second promotion model adds TBS overall class rank

[11] Derived from the fitreps, the 'accpromo' variable represents recommendation for early promotion, and equals 1 if there is at least one such fitrep received between the commissioning date and the promotion point of an individual, whereas 'nopromote' variable represents 'not recommended for promotion' marking, and equals 1 if there is at least one such fitrep received by the individual through his or her career (see Table 4.11).

percentile and MOS group variables. Tables 5.5A and 5.5B summarize the model specifications of the bivariate probits.

Table 5.5A. Bivariate Probit First-Stage Survival to O-4 and O-5 Board Models.

Survived_O-4Brd= ***f*** (Marital Status at Accession, **Commissioning Age**, Gender, Ethnicity Group, **Nopromote_O1O3, Accpromo_O1O3**, TBS Overall Class Rank Percentile, MOS Group, Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year)
Survived_O-5Brd= ***f*** (Marital Status at Accession, **Commissioning Age**, Gender, Ethnicity Group, **Nopromote_O1O4, Accpromo_O1O4,** TBS Overall Class Rank Percentile, MOS Group, Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year)

Table 5.5B. Bivariate Probit Second-Stage O-4 and O-5 Promotion Model Specifications.

1. Prom_O4 / Prom_O5 = ***f*** (Marital status at O-3/O-4, Gender, Ethnicity Group, Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year, **rho**)
2. Prom_O4 / Prom_O5 = ***f*** (Marital status at O-3/O-4, Gender, Ethnicity Group**, TBS Overall Class Rank Percentile, MOS Group,** Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year, **rho**)

2. Hypothesized Effects of the Explanatory Variables

The hypothesized effects of the explanatory variables on actual promotion outcomes are shown in Table 5.6. Different from the hypothesized effects on retention, the models assume no clear relationship between minority status and promotion. As Mehay (1995) finds there is no direct statistically significant relationship between race/ethnicity and promotion after background characteristics are controlled. Officers from enlisted commissioning programs and prior enlisted officers are assumed to have higher promotion rate to O-4. However, the model assumes that these officers have lower O-5 promotion probabilities:

> With additional years of service, prior enlisted officers may be eligible for retirement when up for promotion. This may affect their motivation or it may affect the promotion board member's decision. Promotion board members may not want to take a chance on an officer who may retire (North and Goldhaber, 1995, pp. 40-41).

Officers from the aviation and aviation support MOS groups are assumed to have higher promotion rates considering the relatively larger requirements at field grades in these two MOS groups. Finally, the models assume that the sign of the rho term will be negative since the officers who leave earlier are expected to have lower O-4 and O-5 promotion probabilities.

Table 5.6. Hypothesized Effects of the Explanatory Variables on O-4 and O-5 Promotion.

Variable Name	Expected Sign		Explanation
	O-4	O-5	
Personal Characteristics			
Married at O-3/ O-4	+	+	(Compared to not married)
Female	?	?	(Compared to male)
White	Base Ethnicity Group		
African American	?	?	
Hispanic	?	?	
Other Race	?	?	
Cognitive Human Capital			
TBS Overall Class Rank Percentile	+	+	
Affective Traits			
Prior Enlisted Service	+	-	(Compared to no prior enlisted experience)
USNA	Base Commissioning Source		
NROTC	?	?	
PLC	?	?	
OCC	?	?	
MECEP	+	-	
ECP	+	-	
MCP	+	-	
Combat MOS	Base MOS Group		
Ground Support MOS	?	?	
Service MOS	?	?	
Aviation MOS	+	+	
Aviation Support MOS	+	+	
Commissioning Fiscal Year	?	?	
rho	-	-	

D. PERFORMANCE INDEX MODELS

1. Model Specification

Two different PI variables are obtained from old and new fitreps for each grade between O-1 and O-4. However, both PI models use the same model specification (except for the O3 and O4 PI's based on the old fitreps. As Table 5.7 shows, the second

model adds TBS overall class rank percentile and MOS group variables. 'Combat' and 'Joint' are binary variables and denote the duty type (See Table 4.11 of Chapter IV). The 'Joint' variable is included only in the O4 PI model because junior officers do not usually serve in joint positions.

Table 5.7. OLS Performance Index (PI) Model Specifications.

1. O1PI / O2PI / O3PI / O4PI =***f*** (Marital Status (at O-1, O-2, O-3, O-4), Commissioning Age, Gender, Ethnicity Group, Combat (O-1, O-2, O-3, O-4), Joint_O-4 (O4PI model only), Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year)
2. O1PI / O2PI / O3PI / O4PI = ***f*** (Marital Status (at O-1, O-2, O-3, O-4), Commissioning Age, Gender, Ethnicity Group, Combat (O-1, O-2, O-3, O-4), Joint_O-4 (O4PI model only), **TBS Overall Class Rank Percentile, MOS Group,** Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year)

A two-step Heckman procedure also is used to estimate O3 and O4 PI from old fitreps. The first step includes a simple probit model to estimate the probability of survival to the O-4 or O-5 promotion board. This procedure is used to contol for possible sample selection bias in the estimated coefficients of the accession program variables.The idea behind the Heckman procedure is that officers who leave as O-3 or O-4 do so because their fitrep scores may be poorer than those who stay to the promotion point. Put another way, officers who made O-3 or O-4 but who did not stay to O-4 and O-5 promotion board may not be a representative sample of all officers. The Heckman procedure obtains an 'Inverse Mills ratio' for each observation in the survival sample. The Inverse Mills ratio, or λ represents the probability that an observation survives to the given promotion point. The procedure requires that the first-stage survival equation include at least one instrumental variable that is related to retention, but not related to the Performance Index. As Table 5.8 displays, MOS groups and commissioning age are used as instrumental variables in the survival equations and excluded from the second stage PI models.

Table 5.8. Two-Step Heckman Selection Model for O-3 and O-4 (PI).

1. Survival to O-4/O-5 = ***f*** (Marital Status (at O-3, O-4), **Commissioning Age**, Gender, Ethnicity Group, TBS Overall Class Rank Percentile, **MOS Group**, Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year)
2. O3PI / O4PI = ***f*** (Marital Status (at O-3, O-4), Gender, Ethnicity Group, Joint_O-4 (O4PI model only), TBS Overall Class Rank Percentile, Prior Enlisted Service, Commissioning Source, Commissioning Fiscal Year, **Inverse Mills ratio**)

2. Hypothesized Effects of the Explanatory Variables

The primary assumption is that the commissioning programs that provide longer and more intensive pre-commissioning acculturation, or that credit enlisted service experience, will be associated with better performance. Therefore, OCC and PLC programs are expected to be negatively associated with higher PI at each grade, whereas MECEP, ECP and MCP graduates and officers with prior enlisted experience are expected to be associated with higher PI (relative to USNA). The effects of minority status and MOS type is not clear, in priori, while we expect that married officers will be associated with higher PI scores. The models assume that serving in combat or joint duties result in better fitreps. The commissioning fiscal years are expected to be positively associated with PI due to grade inflation over time. The model also assumes that the Inverse Mills ratio will be negative since the officers who leave earlier are expected to have lower average PI scores. Table 5.9 summarizes the hypothesized effects of the explanatory variables.

Table 5.9. Hypothesized Effects of the Explanatory Variables on PI.

Variable Name	Expected Sign
Personal Characteristics	
Married (at O-1,O-2,O-3,O-4)	+ (Compared to not married)
Commissioning Age	+
Female	? (Compared to male)
White	Base Ethnicity Group
African American	?
Hispanic	?
Other Race	?
Cognitive Human Capital	
TBS Overall Class Rank Percentile	+
Affective Traits	
Prior Enlisted Service	+ (Compared to no prior enlisted experience)
USNA	Base Commissioning Source
NROTC	?
PLC	-
OCC	-
MECEP	+
ECP	+
MCP	+
Combat MOS	Base MOS Group
Ground Support MOS	?
Service MOS	?
Aviation MOS	?
Aviation Support MOS	?
Commissioning Fiscal Year	+
Lambda (λ)	-

E. SUMMARY

This chapter described the model specifications for the five basic performance variables used in the study. The TBS and PI models use OLS regression to analyze the dependent class rank percentiles and PI scores. Logistic regression is the technique used to analyze retention behavior. Finally, the O-4 and O-5 promotion models apply bivariate probit with sample selection to correct for possible sample selection bias. The model specifications are based on the findings of prior studies and availability of the variables in the data set. All models include the six commissioning programs, –and MCP when available– as the focus variables. The rest of the explanatory variables are chosen from the three categories (personal characteristics, cognitive human capital, and affective skills) depending on the dependent performance variable used.

VI. RESULTS OF THE MULTIVARIATE MODELS

This chapter contains regression results for each of the five performance measures for which there were significant differences in means among the commissioning programs in Chapter IV. Each section below presents descriptive statistics for the variables used in the models. Then, regression results are presented in the second part of each section for two different models. Except for the TBS models, the second models add TBS class rank and MOS variables to the first specification.

A. PERFORMANCE AT TBS ESTIMATES

1. Descriptive Statistics

The models analyze data on 27,532 officers from 20 cohorts accessed between FY 1980 and 1999. Table 6.1A contains the sample means for the variables used in the OLS estimations for each commissioning source. As the table shows, officers from PLC account for 36.6 percent of the total sample and PLC and OCC combined account for more than 60 percent. The three enlisted programs account for less than 8 percent, while USNA and NROTC graduates make up the remaining 30 percent. Sample means are listed in the regression results table below.

Table 6.1A. Sample Means by Commissioning Source.

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP
TBS Overall Class Rank Perc.	53.54	54.79	47.36	43.45	73.08	56.98	62.71
TBS Academic Class Rank Perc.	54.92	55.07	47.05	43.85	68.73	55.17	59.45
TBS Leadership Class Rank Perc.	50.41	53.14	48.04	45.45	72.57	57.61	63.15
Married at Accession	0.159	0.216	0.273	0.290	0.758	0.576	0.770
Commissioning Age	22.33	22.28	22.78	24.43	26.71	26.09	27.08
Female	0.049	0.055	0.009	0.097	0.059	0.016	0.038
White	0.848	0.913	0.881	0.839	0.821	0.850	0.679
African American	0.070	0.043	0.046	0.076	0.091	0.093	0.158
Hispanic	0.044	0.020	0.040	0.050	0.058	0.033	0.105
Other Race	0.039	0.024	0.033	0.035	0.030	0.024	0.057
Aviation Option	0.800	0.018	0.452	0.227	0	0	0
Law Option	0	0	0.059	0.026	0	0	0
Prior Enlisted	0.018	0.031	0.066	0.369	1.0	1.0	1.0
N	0.112	0.188	0.366	0.252	0.038	0.036	0.008
Number	**3,072**	**5,181**	**10,085**	**6,948**	**1,036**	**1,001**	**209**

The sample size falls to 21,610 in the second model when GCT information is included. The second sample excludes all observations in TBS class years 1980, 1981,

1990, and 1999 (a total of 5,378) since GCT information is missing for almost one third of each of these cohorts. In addition, 544 observations missing GCT scores across the 16 remaining cohorts are deleted. Table 6.1B contains mean values of TBS overall, academic, leadership class rank percentiles, GCT thirds and prior enlisted by commissioning programs. Mean comparisons between the two samples (Tables 6.16A and 6.1B) for TBS measures and prior enlisted reveal that second sample means are consistent with the first sample. GCT information provides background information for officers from the seven commissioning programs. More than 50 percent of USNA graduates and 40 percent of NROTC and MECEP graduates are in the top one-third on the GCT test. On the other hand, 57 percent of MCP, more than 40 percent of ECP, PLC, and OCC graduates are in the bottom one-third on the GCT test.

Table 6.1B. Sample Means by Commissioning Source[a].

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP
TBS Overall Class Rank Percentile	53.21	54.68	47.70	43.54	73.46	56.73	62.58
TBS Academic Class Rank Perc.	54.78	55.10	47.14	43.92	69.01	54.77	61.03
TBS Leadership Class Rank Perc.	50.06	52.97	48.37	45.54	72.95	57.55	62.62
GCTbotthird	0.136	0.239	0.408	0.442	0.218	0.439	0.569
GCTmidthird	0.325	0.359	0.379	0.359	0.369	0.333	0.271
GCTtopthird	0.539	0.402	0.213	0.199	0.413	0.228	0.160
Prior Enlisted	0.016	0.032	0.064	0.385	1.0	1.0	1.0
N	0.114	0.189	0.363	0.257	0.036	0.034	0.007
Number	**2,456**	**4,093**	**7,854**	**5,550**	**780**	**733**	**144**

[a] Reduced sample when GCT added, N=21,610.

2. OLS Regression Estimates

Table 6.2 shows variable means, coefficients, standard errors and P-values from the OLS regressions on TBS overall class rank. Model 2 shows the results after GCT is added to the first specification. Using 27,532 observations, model 1 explains 11.3 percent of the variation in TBS overall class rank. Adding GCT information in model 2 increases the R^2 to 18.1 percent. In both models, most of the explanatory variables are statistically significant.

Model 1 results find that officers from MECEP and ECP programs have 17.4 and 9.4 percentile points higher class standing relative to USNA graduates, respectively, while the effect of ECP is not significant. On the other hand, PLC and OCC graduates have nearly 7.5 to 10 percentile points lower class rank (compared to USNA). NROTC

graduates have a one percentile point advantage in TBS overall class rank, but it is not statistically significant.

When GCT is included in model 2, NROTC and ECP become significant, while the PLC program becomes insignificant. As Table 6.1B explains, officers from these three commissioning sources have lower GCT scores relative to USNA. Controlling for GCT scores, model 2 reveals that NROTC and ECP graduates have 2.7 to 4.1 percentile points higher TBS overall class ranks (compared to USNA). On the other hand, the reason that PLC becomes insignificant in model 2 can be attributed to the addition of GCT, which creates a significant difference between PLC and USNA. Similarly, controlling for GCT reduces OCC's negative coefficient in model 2; however, the difference cannot be explained only by GCT since its coefficient is still significant. The second model also supports the significantly higher success rates of officers from the enlisted commissioning programs. In both models, officers with four years of active prior enlisted service are positively associated with TBS overall class rank.

Other variables that have significant and positive associations with overall TBS class rank are being married, law program, and GCT score. Controlling for GCT also makes aviation variable insignificant, and reduces but does not eliminate the negative impact of minority status on TBS overall class rank. Officers in the top one-third on the GCT test have 20.5 percentile points higher TBS overall class rank compared to those in the bottom one-third.

The results of the models of TBS class ranking in leadership, academic and military areas are presented in Appendix D. The OLS results for these three estimates are generally consistent with the findings of the overall class rank model in Table 6.2. Enlisted commissioning programs and officers with prior enlisted service are significantly and positively associated with all of the three performance measures at TBS. However, some coefficients have different signs from the overall class rank regression results, while some are not significant. Since GCT information increases the explanatory power of the models by 5 to 7 percentage points, results for the second models from Appendix D estimates are reviewed below, focusing on the differences with the TBS overall class rank model.

The regression results show that being married is not significant in explaining leadership class rank, whereas aviation and law program participants have nearly three points lower leadership class ranks percentiles. While NROTC is not significant, MECEP graduates have the highest class rank as they did in the overall rank model –16.3 percentile points higher than USNA graduates. The academic class rank regression estimates yield similar effects of commissioning sources, prior enlisted experience and minority status. Officers from the law program have 11.6 percentiles points higher academic class ranks compared to officers in the ground option. Finally, military class rank estimates show that PLC participants have 1.5 percentile points higher military class rank and OCC graduates' academic standing is no different from USNA graduates. Females have 12.75 percentile points lower military class ranks compared to males. MCP graduates are the top performers in both the academic and military scores.

Table 6.2. Ordinary Least Squares Estimates of TBS Overall Class Standing Percentile.

Variable	**Model 1**			**Model 2**		
	Mean Value	Coefficient (Std. Error)	P- Value	Mean Value	Coefficient (Std. Error)	P- Value
Intercept	-	56.316 (2.41)	< .0001	-	32.94 (2.68)	< .0001
Married_acc	0.287	2.874 (0.38)	< .0001	0.264	2.041 (0.43)	< .0001
Comm_age	23.35	- 0.051 (0.11)	.6269	23.36	0.367 (0.12)	.0015
Female	0.047	- 10.873 (0.79)	< .0001	0.046	- 8.979 (0.87)	< .0001
White (base case)	0.868	-		0.866	-	
Africaname	0.060	- 25.329 (0.70)	< .0001	0.061	- 19.641 (0.77)	< .0001
Hispanic	0.040	- 13.979 (0.84)	< .0001	0.041	- 10.607 (0.91)	< .0001
Otherrace	0.032	- 8.368 (0.93)	< .0001	0.032	- 7.335 (1.01)	< .0001
Avioption	0.316	1.385 (0.43)	.0012	0.316	-0.400 (0.47)	.392
Lawoption	0.028	4.338 (1.03)	< .0001	.028	2.212 (1.12)	.0473
Priorenl	0.207	2.583 (0.58)	< .0001	0.207	3.291 (0.62)	< .0001
USNA (base case)	0.112	-	-	0.114	-	-
NROTC	0.188	1.063 (0.71)	.1316	0.189	2.679 (0.77)	.0005

Table 6.2. Ordinary Least Squares Estimates of TBS Overall Class Standing Percentile (cont.)

PLC	0.366	- 7.534 (0.59)	< .0001	0.363	- 0.994 (0.65)	.1235
OCC	0.252	- 9.853 (0.68)	< .0001	0.257	- 4.884 (0.75)	< .0001
MECEP	0.038	17.367 (1.21)	< .0001	0.036	16.459 (1.33)	< .0001
ECP	0.036	0.946 (1.20)	.4300	0.034	4.061 (1.33)	.0022
MCP	0.008	9.352 (2.08)	< .0001	0.007	13.712 (2.38)	< .0001
GCTbotthird (base case)	-			0.349	-	
GCTmidthird	-			0.361	10.706 (0.43)	< .0001
GCTtopthird	-			0.290	20.521 (0.48)	< .0001
Dependent Variable	50.0	-		50.0		
		N = 27,532 R^2 =0.113	P = .0001		N = 21,610 R^2 =0.181	P = .0001

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

B. 10 YCS RETENTION MODEL

1. Descriptive Statistics

After deleting 2,609 officers who left involuntarily and 837 observations with missing data, 13,222 officers who entered between FY 1980 and 1990 are included in the sample for the retention model. Cohorts that accessed between after FY 1991 are excluded from the sample since they were not eligible for 10-year retention as of 30 September 2000, which is the end date of data (see Figure 4.4, Chapter IV). Of these 13,222 observations, 7,305 officers (55.25 percent) remained in service for at least 10 years, whereas 5,917 (44.75 percent) left voluntarily before 10-year point. Table 6.3 provides sample means by commissioning source. Sample means are listed in the logistic regression results table for 13,222 observations. The share of each commissioning program in the sample is almost identical to those in the TBS sample; PLC and OCC graduates account for more than 60 percent of the sample, enlisted programs make up 6.7 percent, and the rest comes from USNA and NROTC.

Table 6.3. Sample Means by Commissioning Source.

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP
Retained_10YCS	0.562	0.553	0.537	0.503	0.860	0.728
Married at Accession	0.276	0.280	0.336	0.386	0.786	0.655
Commissioning Age	22.09	22.01	22.66	24.18	26.44	25.83
Female	0.034	0.048	0.006	0.099	0.059	0.023
White	0.861	0.926	0.915	0.885	0.880	0.867
African American	0.070	0.041	0.033	0.061	0.071	0.099
Hispanic	0.041	0.016	0.026	0.023	0.039	0.021
Other Race	0.029	0.017	0.027	0.030	0.010	0.013
TBS Overall Class Rank Percentile	53.52	56.92	49.26	46.93	73.94	63.17
COMBAT_MOS	0.321	0.441	0.295	0.311	0.302	0.295
GRSUPPORT_MOS	0.185	0.187	0.161	0.216	0.246	0.261
SERVICE_MOS	0.109	0.099	0.152	0.160	0.251	0.179
AVIATION_MOS	0.331	0.214	0.330	0.237	0.088	0.122
AVSUPPORT_MOS	0.082	0.080	0.078	0.096	0.147	0.166
Prior Enlisted	0.012	0.015	0.036	0.161	1.0	1.0
FY-80	0.110	0.078	0.070	0.081	0.052	0.103
FY-81	0.075	0.079	0.082	0.086	0.091	0.112
FY-82	0.088	0.075	0.095	0.137	0.103	0.103
FY-83	0.110	0.093	0.123	0.207	0.096	0.126
FY-84	0.096	0.095	0.125	0.069	0.069	0.059
FY-85	0.096	0.084	0.099	0.062	0.088	0.105
FY-86	0.094	0.090	0.084	0.056	0.074	0.137
FY-87	0.095	0.104	0.078	0.107	0.103	0.086
FY-88	0.108	0.107	0.091	0.035	0.098	0.044
FY-89	0.068	0.103	0.076	0.095	0.125	0.074
FY-90	0.059	0.092	0.077	0.066	0.101	0.051
N	0.113	0.215	0.386	0.220	0.031	0.036
Number	1,494	2,841	5,099	2,906	407	475

2. Logit 10-Year Retention Estimates

Table 6.5 below contains a list of variables used in the logit model, the sample means for each variable, and the coefficients, standard errors (in parentheses), and marginal effects obtained from the two logit models. The Pseudo R-squared is 0.047 and 0.088, respectively. Table 6.4 shows that model 2 predicts 62.9 percent of the retention decisions correctly. Note that this exceeds the 'naïve' model that would predict everyone stays and would therefore correctly classify 55 percent of the observations.

Table 6.4. 10-Year Retention Model Classification Table.

Observed			Predicted		
			Retained_10YCS		Percentage Correct
			0	1	
Retained_10YCS	5,917	0	3,257	2,660	55.0
	7,305	1	2,251	5,054	69.2
Overall Percentage					62.9

a The cut off value is .500

In both models, PLC and OCC programs have a negative and significant effect on retention. On the other hand, officers from MECEP and those with prior enlisted service are positively associated with retention, whereas NROTC and ECP are not statistically significant. Other significant variables are female, married at accession, commissioning age, and commissioning fiscal year dummies.

Controlling for TBS and MOS groups in model 2 eliminates the differences among ethnic groups; however, the coefficient for female turns out to be positively associated with retention, which is contrary to expectations. The coefficients for the commissioning sources also decrease slightly, but they are highly significant. The Wald Test for the joint exclusion of the fiscal year dummies rejects the null that coefficients of the commissioning fiscal year variables equal zero with a p-value of less than 0.01 in both models. Compared to the fiscal year 1980 cohort, retention decreased with a decreasing rate over time. Columns four and six contain the partial derivatives (dp/dx) that yield the percentage point change in the retention rate due to a one-unit increase in each explanatory variable.

The retention rate for the base group –at mean values for the continuous variables and zero for the binary variables– is 0.608 in model 2. The results indicate that officers from MECEP have 17.2 percentile points higher retention rates (compared to USNA), which is in addition to 7.93 percentage points difference for prior enlisted. This brings the predicted retention rate for MECEP officers to 86 percent. On the other hand, PLC and OCC graduates have 3 and 9 percentage points lower 10-year retention rates relative to USNA graduates. Another significant variable positively affecting retention is TBS overall class rank. One percentile increase in overall class rank is associated with 0.16 percentage points increase in retention rate. The small size of the effect is deceiving when a comparison between a top performer at TBS and one at the 50^{th} percentile is performed: the former has eight percentage points higher retention rate. Married officers have 7.7 percentage points higher retention rates compared to single ones, whereas being one year older at commissioning point increases 10-year retention by 1.95 points. All MOSs, except aviation, negatively affect retention compared to combat MOS group. The negative effect of ground support, service and aviation support MOSs on retention varies

between 2.1 and 6.2 percentage points. Consistent with the model's expectations, pilots have 15.6 percentage points higher retention rates relative ground combat MOS.

Compared to the 10-year retention model results of O'Brien (2002) who analyzed retention using 5,712 observations from four cohorts (1980,1983,1986,1989), both model results in Table 6.5 find exactly the same associations between the commissioning sources and 10-year retention. O'Brien's results also indicate the positive impact of being married at accession, and TBS performance on retention. However, O'Brien find no significant effect of minority status on 10-year retention, whereas Model 2 find a positive effect of African American, which is marginally significant at the 10-percent level and increases 10-year retention by 3.3 percentage points. Also, commissioning age, female, and prior enlisted were omitted from O'Brien's model but found to positively and significantly affect 10-year retention here.

Table 6.5. Logit Estimates of Retention to 10 YCS.

Variable	**Mean Value**	Model 1		Model 2	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
Intercept	-	- 0.941 (0.292)	-	- 1.798 (0.301)	-
Married_Acc	0.353	0.347*** (0.042)	7.25	0.337*** (0.043)	7.69
Comm_age	23.02	0.070*** (0.013)	1.55	0.082*** (0.013)	1.95
Female	0.041	- 0.198** (0.092)	- 4.55	0.169** (0.096)	3.96
White (base case)	0.902				
Africaname	0.049	- 0.209*** (0.084)	- 4.82	0.140* (0.087)	3.29
Hispanic	0.025	- 0.128 (0.115)	-	0.037 (0.118)	-
Otherrace	0.025	- 0.015 (0.116)	-	0.076 (0.118)	-
TBS Overall Class Rank Percentile	52.14	N.A.		0.007*** (0.001)	0.16
Combat_MOS (base case)	0.333	N.A.			
Grsupport_MOS	0.187	N.A.		- 0.248*** (0.052)	- 6.04
Service_MOS	0.141	N.A.		- 0.253*** (0.060)	- 6.17
Aviation_MOS	0.270	N.A.		0.735*** (0.049)	15.58
Avsupport_MOS	0.088	N.A.		-0.088* (0.067)	-2.11

Table 6.5. Logit Estimates of Retention to10 YCS (cont.)

Priorenl	0.121	0.320*** (0.089)	6.74	0.349*** (0.091)	7.93
USNA (base case)	0.113				
NROTC	0.215	- 0.048 (0.065)	-	0.023 (0.067)	-
PLC	0.386	- 0.170*** (0.061)	-3.89	- 0.125** (0.062)	-3.02
OCC	0.220	- 0.445*** (0.071)	-10.52	- 0.362*** (0.073)	- 8.87
MECEP	0.031	0.792*** (0.178)	14.97	0.826*** (0.180)	17.19
ECP	0.036	0.021 (0.147)	-	0.098 (0.150)	-
FY-80 (base case)	0.079				
FY-81	0.083	- 0.031 (0.093)	-	0.010 (0.095)	-
FY-82	0.100	- 0.688*** (0.087)	-16.57	-0.641*** (0.089)	-15.82
FY-83	0.133	- 0.634*** (0.083)	-15.22	-0.580*** (0.085)	-14.28
FY-84	0.099	- 0.673*** (0.088)	-16.20	-0.555*** (0.090)	-13.67
FY-85	0.087	- 0.578*** (0.091)	-13.82	-0.496*** (0.093)	-12.22
FY-86	0.082	- 0.326*** (0.093)	-7.62	-0.253*** (0.095)	-6.16
FY-87	0.093	- 0.617*** (0.091)	-14.79	-0.584*** (0.093)	-14.41
FY-88	0.083	- 0.474*** (0.093)	-11.25	-0.425*** (0.095)	-10.45
FY-89	0.087	- 0.236*** (0.094)	-5.45	-0.241*** (0.096)	-5.85
FY-90	0.075	- 0.309*** (0.096)	-7.20	-0.281*** (0.098)	-6.85
Dependent Variable	0.553				
		N = 13,222 -2 Log L =17,550.94 P = <.0001		N = 13,222 -2 Log L =16,972.06 P = <.0001	

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

C. O-4 PROMOTION MODEL

1. Descriptive Statistics

The analysis sample includes 15,627 officers from 11 cohorts accessed between fiscal years 1980 and 1990 after deleting observations missing for data used in the analysis. Cohorts after 1990 are not included in the sample since they were not eligible for O-4 promotion as of the end date of the MCCOAC file. Of these 15,627 officers,

7,181 (46.59 percent) survived to O-4 board, while 8,346 (53.41 percent) left. Table 6.6 presents the sample means by commissioning source used in the O-4 promotion models for 7,181 individuals who stayed until O-4 promotion board. The proportion of each commissioning source in the sample is similar to those in the TBS and retention samples –PLC and OCC account for 60 percent; enlisted programs make up nine percent; USNA and NROTC are 31 percent of the total. Overall sample means are presented in the regression results table below. The binary dependent "prom_O4" variable represents whether or not an observation promoted to O-4.

Table 6.6 Sample Means by Commissioning Source

Variable	**USNA**	NROTC	**PLC**	**OCC**	**MECEP**	**ECP**
Prom_O4	0.720	0.711	0.735	0.771	0.733	0.731
Married at O-3	0.638	0.654	0.660	0.679	0.879	0.793
Commissioning Age	22.08	22.05	22.74	24.42	26.44	25.95
Female	0.028	0.038	0.004	0.094	0.058	0.024
White	0.873	0.932	0.919	0.891	0.891	0.855
African American	0.059	0.037	0.029	0.056	0.063	0.101
Hispanic	0.043	0.013	0.025	0.021	0.035	0.027
Other Race	0.026	0.018	0.027	0.032	0.012	0.018
TBS Overall Class Rank Percentile	56.65	58.77	52.60	51.63	75.66	66.88
COMBAT_MOS	0.315	0.446	0.258	0.269	0.305	0.284
GRSUPPORT_MOS	0.132	0.145	0.125	0.195	0.250	0.254
SERVICE_MOS	0.082	0.080	0.121	0.154	0.241	0.157
AVIATION_MOS	0.426	0.276	0.445	0.309	0.097	0.151
AVSUPPORT_MOS	0.067	0.072	0.062	0.093	0.138	0.175
Prior Enlisted	0.018	0.022	0.055	0.179	1.0	1.0
FY-80	0.108	0.090	0.081	0.098	0.052	0.112
FY-81	0.059	0.072	0.076	0.113	0.081	0.139
FY-82	0.074	0.068	0.072	0.127	0.092	0.092
FY-83	0.106	0.088	0.101	0.186	0.098	0.110
FY-84	0.079	0.087	0.108	0.059	0.060	0.068
FY-85	0.088	0.082	0.092	0.053	0.083	0.107
FY-86	0.108	0.091	0.095	0.062	0.081	0.130
FY-87	0.097	0.114	0.085	0.084	0.103	0.071
FY-88	0.116	0.101	0.099	0.036	0.101	0.047
FY-89	0.093	0.112	0.098	0.108	0.132	0.074
FY-90	0.072	0.096	0.093	0.076	0.118	0.050
N	0.113	0.215	0.379	0.198	0.048	0.046
Number	821	1,568	2,762	1,444	348	338

2. O-4 Promotion Estimates

As discussed in Chapter V, two different promotion models--simple and bivariate probit with sample selection correction--are estimated. Table 6.7 contains the results of

both the simple probit and bivariate probit with sample selection for model 1, which excludes TBS overall class rank and MOS groups.

Model 1 probit results find that all commissioning sources, except MECEP, have higher O-4 promotion rates compared to USNA. Unlike the model's expectations, PLC and OCC graduates have 7 to 10.5 percentage points higher O-4 promotion probabilities relative to USNA, respectively. NROTC is significant and increases O-4 promotion by 4.5 percentage points. While prior enlisted variable is not significant, ECP is associated with 5.7 percentage points higher O-4 promotion probabilities at the 10-percentge point significance level. Promotion probabilities rose for each cohort, which is expected considering the decreasing retention rates over these years. African Americans have five percentage points lower promotion probabilities, whereas females have 6.74 percentage points higher O-4 promotion rates. Marital status at O-3 is very significant, and increases the O-4 promotion probability by four percentage points.

Columns five and six of Table 6.7 contain bivariate probit results for Model 1. As Table 6.7 shows, 'rho' term is significant and negative that indicates a negative correlation between the error terms of survival and promotion models. In other terms, the results of the logistic regression for Model 1 have downward bias because the officers who left before the O-4 promotion board would have had lower promotion rates if they had stayed in service to be considered by O-4 boards. The bivariate probit model results show that all commissioning sources that are significant in the simple probit model are significant in the bivariate probit model too. PLC and OCC graduates have 10 to 14 percentage points higher O-4 promotion rates. Similarly, NROTC and ECP increase O-4 promotion rate by 7.5 to 9 percentage points. Controlling for sample selection bias eliminates the negative effect of minority, bivariate probit results find that female is still significantly associated with O-4 promotion.

Table 6.7. Estimates of O-4 Promotion for Model 1.

Variable	**Mean Value**	**Model 1** (Simple Probit)		**Model 1** (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
Intercept	-				
Married_O3	0.677	0.120*** (0.032)	3.96	0.125*** (0.032)	4.31
Female	0.035	0.204** (0.092)	6.74	0.243*** (0.091)	8.76
White (base case)	0.907				
Africaname	0.045	- 0.151** (0.075)	- 4.97	- 0.092 (0.075)	-
Hispanic	0.024	- 0.022 (0.104)	-	0.017 (0.102)	-
Otherrace	0.025	- 0.056 (0.103)	-	- 0.035 (0.101)	-
Priorenl	0.157	0.052 (0.071)	-	- 0.003 (0.071)	-
USNA (base case)	0.113				
NROTC	0.215	0.137*** (0.049)	4.51	0.225*** (0.053)	7.54
PLC	0.379	0.212*** (0.044)	7.02	0.328*** (0.050)	10.01
OCC	0.198	0.317*** (0.053)	10.48	0.449*** (0.059)	13.89
MECEP	0.048	0.103 (0.107)	-	0.114 (0.107)	-
ECP	0.046	0.173* (0.107)	5.70	0.270*** (0.109)	9.07
FY-80 (base case)	0.089				
FY-81	0.084	0.305*** (0.066)	10.06	0.420*** (0.069)	13.33
FY-82	0.084	0.361*** (0.066)	11.91	0.513*** (0.072)	15.25
FY-83	0.116	0.357*** (0.059)	11.79	0.492*** (0.065)	15.26
FY-84	0.086	0.213*** (0.064	7.02	0.355*** (0.069)	10.87
FY-85	0.082	0.334*** (0.065)	11.03	0.464*** (0.070)	15.24
FY-86	0.090	0.335*** (0.063)	11.07	0.442*** (0.065)	15.49
FY-87	0.092	0.356*** (0.063)	11.75	0.498*** (0.068)	15.99
FY-88	0.086	0.506*** (0.066)	16.71	0.621*** (0.068)	21.30

Table 6.7 Estimates of O-4 Promotion for Model 1 (cont.)

Variable	**Mean Value**	**Model 1** (Simple Probit)		**Model 1** (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
FY-89	0.103	0.426*** (0.062)	14.08	0.518*** (0.064)	18.33
FY-90	0.087	0.545*** (0.067)	18.01	0.630*** (0.069)	22.27
rho		-		- 0.295*** (0.061)	
Dependent Variable	0.735	-			
		N = 7,281 -2 Log L =8,357.59 P = <.0001		N = 7,281 -2 Log L = 14,051.26 P = <.0001	

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

Table 6.8 contains the results of the second promotion model, which includes TBS overall class rank and MOS groups. As noted, both simple and bivariate probit regressions are estimated. The simple probit results of Table 6.8 show that controlling for TBS overall class rank and MOS in model 2 increases the explanatory power of the models, eliminates the effect of minority status and makes some commissioning programs insignificant or negative (compared to simple probit model 1 results above). Simple probit estimates of model 2 reveal that only PLC and OCC graduates have significantly higher O-4 promotion rates relative to USNA. NROTC that had a positive association in model 1 is negative, but marginally significant. Also, insignificant in Model 1, MECEP is negative and significant in model 2. On the contrary, ECP that was marginally significant in model is not significant in Model 2.

The second part of Table 6.8 contains bivariate probit results for Model 2. The bivariate probit corrects for sample selection via the first-stage survival model, which is presented in Appendix E. As in model 1, 'rho' term is significant and negative, which explains that Model 2 simple probit results had a downward bias. The bivariate probit makes NROTC insignificant, while ECP stays insignificant in both models. MECEP graduates have 1.61 percentage points lower O-4 promotion rates. In addition prior enlisted is negative and decreases O-4 promotion by two percentage points. The negative impact of MECEP should be added to the negative effect of prior enlisted, since all

MECEP graduates are prior enlisted. In other terms, MECEP has a significant and negative association with O-4 promotion on top of prior enlisted variable's negative effect. Other than commissioning programs, being married or female, TBS overall class rank, aviation and ground support MOS's increase O-4 promotion significantly. Surprisingly, bivariate probit results indicate that pilots have 10 percentage points lower O-4 promotion rates. As model 1 results indicated, bivariate probit estimates find that the O-4 promotion rates of the FY 1981 through 1990 cohorts increased by 9.4 to 21 percentage points over time compared to the FY 1980 cohort.

Table 6.8. Estimates of O-4 Promotion for Model 2.

Variable	**Mean Value**	**Model 2** (Simple Probit)		**Model 2** (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
Intercept	-		-		
Married_O3	0.677	0.070** (0.034)	2.26	0.077*** (0.032)	2.72
Female	0.035	0.153* (0.096)	4.93	0.152** (0.091)	5.92
White (base case)	0.907				
Africaname	0.045	- 0.022 (0.077)	-	0.024 (0.075)	-
Hispanic	0.024	0.042 (0.106)	-	0.087 (0.105)	-
Otherrace	0.025	- 0.077 (0.105)	-	- 0.054 (0.101)	-
TBS Overall Class Rank Percentile	55.96	0.008*** (0.001)	0.26	0.007*** (0.001)	0.30
Combat_MOS (base case)	0.311				
Grsupport_MOS	0.156	0.004 (0.050)	-	0.079* (0.050)	1.47
Service_MOS	0.122	- 0.013 (0.057)	-	0.055 (0.056)	-
Aviation_MOS	0.349	- 0.339*** (0.039)	-10.95	- 0.365*** (0.039)	-9.84
Avsupport_MOS	0.080	0.073 (0.065)	-	0.120** (0.064)	3.21
Priorenl	0.157	- 0.046 (0.072)	-	- 0.130** (0.071)	- 2.01
USNA (base case)	0.113				
NROTC	0.215	- 0.067* (0.052)	- 2.16	0.069 (0.548)	-

Table 6.8. Estimates of O-4 Promotion for Model 2 (cont.).

Variable	Mean Value	Model 2 (Simple Probit)		Model 2 (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
PLC	0.379	0.128*** (0.047)	4.13	0.300*** (0.053)	8.61
OCC	0.198	0.205*** (0.055)	6.63	0.391*** (0.059)	11.41
MECEP	0.048	- 0.196** (0.111)	- 6.33	- 0.179** (0.109)	-1.61
ECP	0.046	- 0.047 (0.111)	-	0.093 (0.110)	-
FY-80 (base case)	0.089				
FY-81	0.084	0.137** (0.069)	4.41	0.315*** (0.071)	9.44
FY-82	0.084	0.190*** (0.070)	6.14	0.420*** (0.074)	11.25
FY-83	0.116	0.180*** (0.063)	5.83	0.389*** (0.068)	11.25
FY-84	0.086	0.032 (0.068)	-	0.249*** (0.073)	6.83
FY-85	0.082	0.178*** (0.070)	5.74	0.376*** (0.074)	12.19
FY-86	0.090	0.178*** (0.067)	5.76	0.349*** (0.069)	12.63
FY-87	0.092	0.227*** (0.067)	7.33	0.448*** (0.072)	14.05
FY-88	0.086	0.388*** (0.071)	12.55	0.565*** (0.073)	19.70
FY-89	0.103	0.349*** (0.067)	11.29	0.496*** (0.068)	18.09
FY-90	0.087	0.451*** (0.718)	14.58	0.585*** (0.072)	21.33
rho		-	-	- 0.425*** (0.065)	
Dependent Variable	0.735				
		N = 7,281 -2 Log L =8,116.29 P = <.0001		N = 7,281 -2 Log L =4,058.77 P = <.0001	

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

D. O-5 PROMOTION MODEL

1. Descriptive Statistics

5,954 observations from the FY 1980 through 1983 cohorts are included in the O-5 promotion analysis after deleting 752 observations missing other data used in the

models and MCP graduates due to their insufficient numbers. Of these 5,954 observations, 1,785 (29.98 percent) survived to the O-5 promotion board and 1,206 (20.25 percent of the analysis sample, 67.56 of the surviving sample) were promoted to O-5. Table 6.8 includes sample means by commissioning sources. Overall sample means are listed in the regression results table below. The lowest mean TBS overall class rank for surviving O-4's is 54.6, which supports the significance of TBS class rank as a good performance predictor. The number of MECEP and ECP graduates is quite low, and may reflect the effect of retirement eligibility on officers with prior enlisted service.

Table 6.9. Sample Means by Commissioning Source.

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP
Prom_O5	0.747	0.717	0.671	0.652	0.588	0.598
Married at O-4	0.912	0.891	0.891	0.849	0.971	0.876
Commissioning Age	22.24	21.87	22.55	24.32	26.03	25.25
Female	0.033	0.058	0.005	0.085	0.029	0.052
White	0.885	0.945	0.967	0.924	0.824	0.907
African American	0.055	0.026	0.016	0.047	0.088	0.041
Hispanic	0.033	0.010	0.006	0.017	0.088	0.021
Other Race	0.028	0.019	0.011	0.011	0.0	0.031
TBS Overall Class Rank Percentile	62.26	62.72	55.50	54.61	82.85	73.51
COMBAT_MOS	0.253	0.482	0.299	0.234	0.618	0.412
GRSUPPORT_MOS	0.088	0.180	0.192	0.204	0.059	0.196
SERVICE_MOS	0.088	0.090	0.125	0.197	0.206	0.144
AVIATION_MOS	0.528	0.206	0.328	0.297	0.088	0.144
AVSUPPORT_MOS	0.071	0.074	0.070	0.087	0.059	0.113
Prior Enlisted	0.006	0.003	0.052	0.061	1.0	1.0
FY-80	0.308	0.289	0.215	0.189	0.177	0.217
FY-81	0.159	0.232	0.236	0.212	0.177	0.320
FY-82	0.231	0.215	0.241	0.253	0.294	0.206
FY-83	0.302	0.264	0.309	0.346	0.353	0.258
N	0.102	0.174	0.354	0.296	0.019	0.054
Number	182	311	632	529	34	97

2. O-5 Promotion Estimates

Table 6.10 presents the variables, overall means, simple and bivariate probit with sample selection correction results for Model 1. The log-likelihood test indicates that the set of the explanatory variables jointly does not equal zero in both models.

The simple probit results find that minority status and being female made no difference in O-5 promotion probabilities. Married officers at O-4 had 13.56 percentage points higher promotion rates, whereas prior enlisted had much lower promotion probabilities (40 percent). NROTC have a marginal and positive effect on O-4 promotion,

whereas PLC and OCC are not significant. Both MECEP and ECP are significant and increase O-4 promotion by 18.5 to 21 percentage points.

Bivariate probit results of Model 1 show that rho is negative and significant. Controlling for sample selection in Model 1 does not make any significant variable from simple probit insignificant. In the contrary, PLC and NROTC become significant at the five-percent level.

Table 6.10 Estimates of O-5 Promotion for Model 1.

Variable	**Mean Value**	**Model 1** (Simple Probit)		**Model 1** (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
Intercept	-				
Married_O4	0.881	0.374*** (0.074)	13.56	0.427*** (0.080)	15.90
Female	0.044	0.147 (0.157)	-	0.164 (0.158)	-
White (base case)	0.936				
Africaname	0.034	- 0.126 (0.168)	-	- 0.075 (0.167)	-
Hispanic	0.015	0.083 (0.259)	-	0.082 (0.251)	-
Otherrace	0.015	- 0.262 (0.248)	-	- 0.227 (0.257)	-
Priorenl	0.111	- 0.738*** (0.160)	- 26.76	- 0.806*** (0.163)	- 27.46
USNA (base case)	0.102				
NROTC	0.174	0.167* (0.103)	6.07	0.257** (0.112)	9.39
PLC	0.354	0.070 (0.089)		0.173** (0.103)	6.30
OCC	0.296	0.029 (0.092)	-	0.127 (0.105)	-
MECEP	0.019	0.510** (0.278)	18.48	0.690*** (0.286)	21.11
ECP	0.054	0.572*** (0.216)	20.74	0.701*** (0.224)	25.00
FY-80 (base case)	0.229				
FY-81	0.224	0.159** (0.089)	5.78	0.207** (0.092)	7.36

Table 6.10 Estimates of O-5 Promotion for Model 1 (cont.).

Variable	Mean Value	Model 1 (Simple Probit)		Model 1 (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
FY-82	0.238	0.024 (0.086)	-	0.091 (0.091)	-
FY-83	0.309	0.143** (0.081)	5.20	0.209*** (0.087)	6.83
rho	-	-	-	- 0.185** (0.084)	
Dependent Variable	0.676	-			
		N = 1,785 -2 Log L =1,111.82 P = .0002		N = 1,785 -2 Log L = 4.410.88 P = P = .0001	

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

Table 6.11 includes Model 2 results estimated by simple and bivariate probit techniques. Simple probit results of Model 2 show that five variables are significant at the 10-percent or better significance level. Minority status, female, and the cohort dummies have no impact on O-5 promotion. Prior enlisted is still very significant, and reduces O-5 promotion probability by 45 percent (29.9 percentage points). TBS overall class rank is highly significant as in the previous models. Aviation support is the only significant MOS, and positively impacts O-5 promotion by 10.4 percentage points. The simple probit results find that only ECP is significant and associated with 14.3 percentage points higher O-4 promotion rates relative to USNA.

Like the previous Bivariate probit models, Model 2 results corrected by bivariate probit find that incorporated from the survival to O-5 promotion board model, rho is negative and significant at the 5-percent level (The first-stage bivariate probit retention results are presented in Appendix E). This indicates that the coefficients from simple probit Model 2 have downward bias. Bivariate probit results find that in addition to ECP, MECEP has a significant effect on O-5 promotion probability. Officers from MECEP and ECP have 14 to 18 percentage points higher O-5 promotion rates, but the considerable negative effect of prior enlisted should be kept in mind when evaluating the effects of prior enlisted programs on O-5 promotion. Prior enlisted officers from any source (that

account for 11 percent of the officers staying to O-5 board) have 45 percent less O-5 promotion rates. However, MECEP and ECP eliminate 46 to 61 percent of this negative effect. Other commissioning programs do not significantly affect O-5 promotion rates.

Table 6.11. Estimates of O-5 Promotion for Model 2.

Variable	**Mean Value**	**Model 2** (Simple Probit)		**Model 2** (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
Intercept	-				
Married_O4	0.881	0.149** (0.085)	5.32	0.197** (0.088)	7.23
Female	0.044	0.193 (0.167)	-	0.205 (0.168)	-
White (base case)	0.936				
Africaname	0.034	0.045 (0.171)	-	0.088 (0.170)	-
Hispanic	0.015	0.136 (0.262)	-	0.135 (0.259)	-
Otherrace	0.015	- 0.268 (0.252)	-	- 0.234 (0.268)	-
TBS Overall Class Rank Percentile	58.68	0.007*** (0.001)	0.24	0.006*** (0.001)	0.26
Combat_MOS (base case)	0.319				
Grsupport_MOS	0.180	- 0.006 (0.090)	-	0.014 (0.090)	-
Service_MOS	0.139	- 0.005 (0.104)	-	0.008 (0.104)	-
Aviation_MOS	0.303	0.080 (0.079)	-	0.118* (0.080)	3.50
Avsupport_MOS	0.078	0.289** (0.127)	10.36	0.299*** (0.127)	11.03
Priorenl	0.111	- 0.836*** (0.162)	- 29.93	- 0.895*** (0.163)	- 30.46
USNA (base case)	0.102				
NROTC	0.174	- 0.021 (0.110)	-	0.075 (0.120)	-
PLC	0.354	- 0.059 (0.094)	-	0.041 (0.108)	-
OCC	0.296	- 0.113 (0.098)		- 0.018 (0.111)	-
MECEP	0.019	0.312 (0.283)	-	0.499** (0.294)	14.04
ECP	0.054	0.400** (0.220)	14.34	0.532*** (0.228)	18.52

Table 6.11 Estimates of O-5 Promotion for Model 2. (cont.)

Variable	Mean Value	Model 2 (Simple Probit)		Model 2 (Bivariate Probit with Sample Selection)	
		Coefficient (Std. Error)	Marginal Effect	Coefficient (Std. Error)	Marginal Effect
FY-80 (base case)	0.229				
FY-81	0.224	0.081 (0.091)	-	0.125* (0.092)	4.28
FY-82	0.238	- 0.069 (0.089)	-	- 0.008 (0.093)	-
FY-83	0.309	0.036 (0.086)	-	0.094 (0.090)	-
rho	-			- 0.176** (0.086)	
Dependent Var.	0.676				
		N = 1,785 -2 Log L =1,088.81 P = <.0001		N = 1,785 -2 Log L = P =	

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

E. PERFORMANCE INDEX (PI) MODELS

1. PI Models Using Old Fitreps

a. Descriptive Statistics

Table 6.12 contains sample means for PI, prior enlisted, and female, as well as the number of officers from each commissioning source and their percentages in the O-1 through O-4 samples. The other explanatory variables in the models are not included since there is not much change in variable means from those provided in descriptive statistics above in the TBS, retention, and promotion samples. MCP is not included in the O-3 and O-4 samples due to an insufficient number of observations. As Table 4.15 in Chapter IV illustrated, the number of cohorts included in each sample decreased for the higher grades because some cohorts were too junior to have reached senior grades (O-4) as of the end date of MCCOAC file. For example, the FY 1980 through 1997 cohorts are included in the analysis of PI for O-1's, whereas observations from only the FY 1980 through 1983 cohorts are used in the analysis for O-4's.

Table 6.12. Sample Means by Commissioning Source.

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP	Overall
O1 PI Sample								
O1 PI	96.70	96.53	95.93	96.13	97.93	96.74	99.54	96.310
Prior Enlisted	0.020	0.032	0.065	0.352	1.0	1.0	1.0	0.199
Female	0.046	0.056	0.004	0.110	0.063	0.017	0.012	0.048
Number of Observations	2,171	4,136	6,888	4,772	727	784	81	19,559
Percentage of each comm. source in the total	0.111	0.212	0.352	0.244	0.037	0.040	0.004	-
O2 PI Sample								
O2 PI	97.93	97.86	97.37	97.36	98.72	97.46	99.35	97.575
Prior Enlisted	0.018	0.027	0.056	0.285	1.0	1.0	1.0	0.163
Female	0.036	0.051	0.005	0.097	0.068	0.018	0.0	0.042
Number of Observations	2,171	4,277	8,260	4,961	681	719	25	21,261
Percentage of each comm. source in the total	0.110	0.201	0.389	0.233	0.032	0.034	0.001	-
O3 PI Sample								
O3 PI	98.72	98.83	98.48	98.23	99.09	98.51		98.56
Prior Enlisted	0.013	0.016	0.043	0.154	1.0	1.0		0.126
Female	0.032	0.045	0.007	0.098	0.060	0.025		0.039
Number of Observations	1,346	2,276	4,013	2,090	385	397		10,507
Percentage of each comm. source in the total	0.128	0.217	0.382	0.199	0.037	0.038		-
O4 PI Sample								
O4 PI	99.83	99.70	99.67	99.77	99.54	99.55		99.708
Prior Enlisted	0.005	0.003	0.056	0.064	1.0	1.0		0.126
Female	0.031	0.063	0.007	0.089	0.082	0.046		0.047
Number of Observations	196	335	699	550	61	109		1,950
Percentage of each comm. source in the total	0.101	0.172	0.359	0.282	0.031	0.056		-

b. O-1 and O-2 PI Estimates

Table 6.13 includes variable means, coefficients, and standard errors (in parentheses) from the O1 and O2 PI regressions for model 1 and model 2. As in the previous models, TBS and MOS groups are included in model 2.

For each grade, Model 1 explains 19 and 22 percent of the variation in the dependent variable. The results show that all variables are significant except female, ECP, and MCP. Officers from NROTC, PLC, OCC and ECP are negatively associated with O1 and O2 performance compared to USNA, whereas MECEP graduates have 0.35 to 0.44 percentage points higher average PI scores as O-1 and O-2. Minorities have between 0.4 to 1.6 percentage points lower PI scores. Commissioning age is another factor that negatively affects O1 and O2 PI scores, while prior enlisted and being married increase PI between 0.48 and 0.21 percentage points. Officers who received at least one combat fitrep as O1 or O2 had between 0.32 and 0.59 percentage points higher PI.

The R^2 increases to 0.307 and 0.246 after including TBS and MOS information in model 2 of O1 and O2 PI, respectively. TBS overall class rank is very significant, and a one percentile point increase in TBS class rank is associated with 0.047 and 0.029 percentage point increase in O1 and O2 PI, respectively. Controlling for TBS performance and MOS groups make female significant and positive, while the negative correlation with minority status loses its significance except for African Americans, which are associated with 0.25 and 0.80 percentage point lower O1 and O2 PI average scores, respectively. Model results also show that all commissioning sources have lower average PI at O-1 and O-2 compared to USNA. Married and prior enlisted are positive and significant in Model 2, too, and increase PI. All MOS groups except aviation support are negatively associated with O2 PI relative to ground combat MOS. Increasing values of fiscal year coefficients indicate that the average PI scores of officers have increased over time compared to the FY 1980 cohort. This is another example of grade inflation in the old fitrep system.

Table 6.13. OLS Estimates of O1 and O2 Performance Index Based on Old Fitreps.

Variable	O-1 PI			O-2 PI		
	Mean Value	Model 1 Coefficient (Std. Error)	Model 2 Coefficient (Std. Error)	Mean Value	Model 1 Coefficient (Std. Error)	Model 2 Coefficient (Std. Error)
Intercept	-	93.907 (0.436)	91.515 (0.415)	-	97.00 (0.345)	95.465 (0.337)
Married_O1/O2	0.286	0.310*** (0.070)	0.175*** (0.067)	0.425	0.336*** (0.046)	0.295*** (0.045)
Comm_age	23.28	- 0.040** (0.019)	- 0.055*** (0.017)	23.17	- 0.056*** (0.015)	- 0.057*** (0.014)
Female	0.048	- 0.064 (0.134)	0.365*** (0.131)	0.042	- 0.032 (0.112)	0.370*** (0.112)
White (base case)	0.871			0.884		
Africaname	0.062	- 1.479*** (0.117)	- 0.225** (0.114)	0.055	- 1.607*** (0.097)	- 0.796*** (0.096)
Hispanic	0.036	- 0.765*** (0.151)	- 0.121 (0.144)	0.033	- 0.421*** (0.124)	- 0.022 (0.120)
Otherrace	0.031	- 0.491*** (0.161)	- 0.152 (0.153)	0.028	- 0.435*** (0.132)	- 0.216** (0.128)
Combat Fitrep O1 / O2	0.019	0.591*** (0.224)	0.762*** (0.214)	0.071	0.323*** (0.100)	0.291*** (0.097)
TBS Overall Class Rank Percentile	49.96	N.A.	0.047*** (0.001)	50.27	N.A.	0.029*** (0.001)
Combat_MOS (base case)	0.377			0.323		
Grsupport_MOS	0.211	N.A.	- 0.116* (0.073)	0.187	N.A.	- 0.367*** (0.062)

Table 6.13. OLS Estimates of O1 and O2 Performance Index Based on Old Fitreps (Cont.).

Variable	O-1 PI			O-2 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
Service_MOS	0.138	N.A.	0.155** (0.087)	0.140	N.A.	- 0.183*** (0.070)
Aviation_MOS	0.191	N.A.	0.025 (0.078)	0.276	N.A.	- 0.133*** (0.056)
Avsupport_MOS	0.097	N.A.	0.596*** (0.094)	0.087	N.A.	0.092 (0.079)
Priorenl	0.199	0.483*** (0.104)	0.348*** (0.098)	0.163	0.207*** (0.086)	0.121* (0.083)
USNA (base case)	0.111			0.110		
NROTC	0.211	-0.175** (0.104)	- 0.193** (0.099)	0.201	- 0.224*** (0.083)	- 0.279*** (0.080)
PLC	0.352	- 0.667*** (0.098)	- 0.309*** (0.092)	0.389	- 0.515*** (0.075)	- 0.312*** (0.073)
OCC	0.244	- 0.759*** (0.112)	- 0.287*** (0.106)	0.233	- 0.460*** (0.087)	- 0.195** (0.085)
MECEP	0.037	0.443** (0.203)	- 0.281* (0.192)	0.032	0.354** (0.167)	- 0.133 (0.162)
ECP	0.040	- 0.196 (0.196)	- 0.232 (0.186)	0.034	- 0.250* (0.164)	- 0.295** (0.158)
MCP	0.004	- 0.034 (0.461)	- 0.555 (0.435)	0.001	- 0.272 (0.648)	- 0.573 (0.626)
Comm_FY1980 (base case)	0.039			0.053		
Comm_FY 1981	0.045	0.054 (0.194)	0.070 (0.184)	0.057	0.530*** (0.134)	0.575*** (0.130)
Comm_FY 1982	0.060	1.144*** (0.183)	1.179*** (0.173)	0.074	0.425*** (0.127)	0.486*** (0.123)
Comm_FY 1983	0.074	2.222*** (0.177)	2.291*** (0.167)	0.095	0.598*** (0.120)	0.629*** (0.117)
Comm_FY 1984	0.065	2.981*** (0.181)	3.068*** (0.171)	0.069	0.639*** (0.128)	0.708*** (0.124)
Comm_FY 1985	0.051	2.998*** (0.191)	3.069*** (0.181)	0.062	1.152*** (0.130)	1.204*** (0.126)
Comm_FY 1986	0.064	2.315*** (0.184)	2.344*** (0.174)	0.061	1.749*** (0.131)	1.817*** (0.127)
Comm_FY 1987	0.076	2.341*** (0.179)	2.355*** (0.169)	0.072	1.908*** (0.132)	1.970*** (0.127)
Comm_FY 1988	0.062	3.649*** (0.185)	3.685*** (0.175)	0.060	2.506*** (0.139)	2.603*** (0.134)
Comm_FY 1989	0.065	3.841*** (0.191)	3.814*** (0.181)	0.066	3.248*** (0.130)	3.315*** (0.125)
Comm_FY 1990	0.054	4.378*** (0.190)	4.429*** (0.180)	0.055	3.677*** (0.135)	3.770*** (0.131)
Comm_FY 1991	0.062	5.075*** (0.186)	5.116*** (0.176)	0.059	3.750*** (0.133)	3.822*** (0.129)
Comm_FY 1992	0.063	5.860*** (0.187)	5.919*** (0.177)	0.061	3.910*** (0.133)	3.994*** (0.128)

Table 6.13. OLS Estimates of O1 and O2 Performance Index Based on Old Fitreps (Cont.).

Variable	O-1 PI			O-2 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
Comm_FY 1993	0.050	6.445*** (0.194)	6.599*** (0.184)	0.053	4.014*** (0.137)	4.137*** (0.132)
Comm_FY 1994	0.041	6.484*** (0.202)	6.539*** (0.191)	0.052	4.095*** (0.137)	4.137*** (0.132)
Comm_FY 1995	0.045	6.530*** (0.199)	6.608*** (0.188)	0.053	3.962*** (0.137)	4.013*** (0.132)
Comm_FY 1996	0.052	6.405*** (0.193)	6.464*** (0.183)	-		
Comm_FY 1997	0.033	6.439*** (0.216)	6.458*** (0.204)	-		
PI	96.310			97.575		
		N= 19,559 R^2 =0.222	**N= 19,559 R^2= 0.307**		**N=21,261 R^2 =0.193**	**N=21,261 R^2 =0.246**

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

c. O-3 and O-4 PI Estimates

Table 6.14 contains variables means and results from the two-step Heckman Procedure for O3 and O4 performance. Columns three and seven contain simple probit estimates of retention at O-3 and O-4 grades. The log-likelihood test indicates that the set of the explanatory variables used in the retention models jointly do not equal zero. In both models MOS and commissioning age instrumental variables are significant at the 10-percent or better levels. Unlike the 10-year retention models above, the retention at O-3 results show that after making O-3 USNA graduates' retention is significantly lower than that of all other commissioning sources. The retention at O-4 results find similar negative association between other commissioning sources and retention at O4. However, only NROTC, PLC, and MECEP are statistically significant. OLS estimates of O-3 and O-4 PI models without sample selection correction are presented in Appendix F.

OLS regression models for PI include Inverse Mills ratio and are obtained from the first-stage probit. They exclude MOS and commissioning age variables from the first stage survival equation. O3 and O4 PI regression estimates explain 13.2 and 2.2 percent of the variation in the dependent variable. Since there is not much variation in the dependent O4 PI, the explanatory power of the O4 PI model is lower. Note that the

coefficients from OLS regression that are included in columns four and seven are very small (ranges between -1 and +2) when compared to the dependent PI variable's range between 0 and 100. For example the effect of one of the biggest coefficients in O3 PI model, which is - 0.706 for MECEP, has a 0.7 percentage point negative effect on the average O3 PI score for MECEP graduates (-0.706/99.09). Similarly, another significant variable, being married at O-4 creates a 0.17 percent increase on the average O4 PI of 99.71 (0.164/99.71). However, when the inflated PI scores in the old fitreps are considered –average O3 PI is 98.56, and O4 PI is 99.71– the coefficients make sense and the regression models indicate that these small digits are significant.

O3 PI OLS results find that most variables are significant. The Inverse Mills ratio (λ) is negative and significant at the 10-percent level, which shows that officers leaving before the promotion point are negatively associated with O3 PI compared to those who stay. The model results show that all commissioning sources have negative associations with O3 PI compared to USNA. MECEP and ECP have the largest negative association with PI; the OLS results also show that MECEP and ECP have 0.71 percentage points lower PI compared to USNA. Other than commissioning sources, married at O3 and TBS overall class rank have a significant positive impact on O3 PI. Minorities are negatively associated with PI at O3, but only African American is significant (PI is lower by 0.28 percentage points). When the results are compared to OLS models that do not control for selection (See Appendix F) we find that the coefficients of the commissioning programs were biased toward zero, in which the negative effects of the programs were understated. This may occur because those who stay from non-USNA programs have few civilian opportunities.

Similarly, O4 PI estimates find that the Inverse Mills ratio (λ) is negative but not significant. This indicates that there is no selection bias among O-4's. The preliminary ANOVA test found (see Table 4.16) that differences in O4 PI means among commissioning sources is significant at the 10-percent level. However, controlling for sample selection by the Heckman procedure in the first stage improves the results and reveals that PLC and ECP graduates have 0.1 to 0.3 percentage points lower O4 PI compared to USNA graduates. Prior enlisted is not significant as in the O3 PI model. Officers who served in joint duties have 0.16 percentage points higher O4 PI scores,

whereas married at O4 increases PI by 0.16 percentage points. Neither the minorities nor the fiscal year dummies are significant.

Table 6.14. OLS Estimates of O3 and O4 Performance Index Based on Old Fitreps.

Variable	O-3 PI				O-4 PI			
	Mean Value	Retention at O-3	Model 1	Model 2	Mean Value	Retention at O-4	Model 1	Model 2
		Coefficient (Std. Err.)	Coefficient (Std. Err.)	Coefficient (Std. Err.)		Coefficient (Std. Err.)	Coefficient (Std. Err.)	Coefficient (Std. Err.)
Intercept	-	- 0.370 (0.215)	100.779 (0.258)	97.425 (0.336)	-	2.234 (0.634)	99.704 (0.122)	99.548 (0.149)
Married_O3/O4	0.656	0.186*** (0.027)	- 0.020 (0.062)	0.283*** (0.065)	0.882	0.147 (0.122)	0.164** (0.072)	0.164** (0.072)
Comm_age	23.06	0.013* (0.010)	N.A.	N.A.	23.17	- 0.041* (0.027)	N.A.	N.A.
Female	0.039	- 0.071 (0.070)	0.414*** (0.139)	0.112 (0.139)	0.047	- 0.171 (0.193)	- 0.043 (0.113)	- 0.043 (0.113)
White (base case)	0.907				0.936			
Africaname	0.045	0.075 (0.065)	- 0.671*** (0.125)	- 0.279** (0.125)	0.036	- 0.115 (0.202)	- 0.147 (0.124)	- 0.118 (0.124)
Hispanic	0.025	- 0.015 (0.086)	0.022 (0.164)	0.146 (0.164)	0.014	0.709* (0.499)	- 0.022 (0.200)	0.042 (0.202)
Otherrace	0.024	0.021 (0.087)	- 0.187 (0.166)	- 0.122 (0.164)	0.014	0.523 (0.472)	0.060 (0.196)	0.103 (0.197)
Joint_O4	-	N.A.	N.A	N.A	0.172	N.A	0.161*** (0.060)	0.162*** (0.060)
TBS Overall Class Rank Percentile	54.61	0.003*** (0.001)	N.A	0.017*** (0.001)	58.78	0.004*** (0.002)	N.A.	0.002** (0.001)
Combat_MOS(base)	0.306				0.305			
Grsupport_MOS	0.157	- 0.064* (0.041)	N.A.	N.A.	0.177	- 0.005 (0.128)	N.A.	N.A.
Service_MOS	0.141	- 0.304*** (0.043)	N.A.	N.A.	0.146	- 0.358*** (0.131)	N.A.	N.A.
Aviation_MOS	0.337	0.087*** (0.033)	N.A.	N.A.	0.315	- .408*** (0.106)	N.A.	N.A.
Avsupport_MOS	0.075	0.038 (0.053)	N.A.	N.A.	0.077	- 0.005 (0.170)	N.A.	N.A.
Priorenl	0.126	0.343*** (0.072)	- 0.528*** (0.132)	- 0.097 (0.133)	0.126	- 0.359** (0.206)	0.090 (0.123)	0.032 (0.126)
USNA (base case)	0.128				0.101			
NROTC	0.217	0.184*** (0.045)	- 0.467*** (0.095)	- 0.175** (0.096)	0.172	- 0.222* (0.172)	-0.116* (0.089)	-0.123* (0.089)
PLC	0.382	0.216*** (0.042)	- 0.765*** (0.089)	- 0.339*** (0.092)	0.359	- 0.272** (0.154)	- 0.117* (0.084)	- 0.123* (0.084)
OCC	0.199	0.211*** (0.051)	- 0.850*** (0.099)	- 0.384*** (0.103)	0.282	0.160 (0.172)	- 0.071 (0.083)	- 0.050 (0.084)
MECEP	0.037	0.594*** (0.119)	- 1.276*** (0.206)	- 0.706*** (0.206)	0.031	- 1.048*** (0.287)	- 0.005 (0.242)	- 0.158 (0.256)
ECP	0.038	0.343*** (0.109)	- 1.185*** (0.198)	- 0.705*** (0.198)	0.056	- 0.012 (0.281)	- 0.316** (0.166)	- 0.306** (0.166)
Comm_FY 1980 (base case)	0.094				0.227			

Table 6.14. OLS Estimates of O3 and O4 Performance Index Based on Old Fitreps (Cont.).

Variable	O-3 PI				O-4 PI			
	Mean Value	**Retention at O-3**	**Model 1**	**Model 2**	**Mean Value**	**Retention at O-4**	**Model 1**	**Model 2**
		Coefficient (Std. Err.)	Coefficient (Std. Err.)	Coefficient (Std. Err.)		Coefficient (Std. Err.)	Coefficient (Std. Err.)	Coefficient (Std. Err.)
Comm_FY 1981	0.091	- 0.094* (0.059)	0.391*** (0.119)	0.239** (0.118)	0.223	0.010 (0.120)	0.117** (0.067)	0.116** (0.067)
Comm_FY 1982	0.096	- 0.168*** (0.058)	0.830*** (0.120)	0.525*** (0.120)	0.236	0.150 (0.122)	0.074 (0.067)	0.082 (0.067)
Comm_FY 1983	0.125	- 0.077* (0.055)	0.901*** (0.110)	0.760*** (0.110)	0.314	- 0.078 (0.110)	0.066 (0.063)	0.050 (0.063)
Comm_FY 1984	0.092	- 0.044 (0.059)	1.192*** (0.118)	1.079*** (0.117)				
Comm_FY 1985	0.087	- 0.026 (0.060)	1.402*** (0.119)	1.328*** (0.118)				
Comm_FY 1986	0.083	0.235*** (0.062)	1.184*** (0.126)	1.576*** (0.127)				
Comm_FY 1987	0.084	0.248*** (0.063)	1.207*** (0.128)	1.623*** (0.129)				
Comm_FY 1988	0.080	0.268*** (0.064)	1.386*** (0.130)	1.839*** (0.132)				
Comm_FY 1989	0.087	0.435*** (0.065)	1.165*** (0.136)	1.840*** (0.142)				
Comm_FY 1990	0.080	0.230*** (0.064)	1.525*** (0.128)	1.922*** (0.129)				
Lambda (λ)	0.518	-	- 4.746*** (0.319)	-1.510*** (0.379)	0.200	-	- 0.689** (0.342)	- 0.374 (0.381)
Retention at O-3/ O-4	0.686				0.894			
PI	98.56				99.71			
		N= 10,507 -2 Log L = 12,444.39	**N= 10,507 R^2= 0.112**	**N= 10,507 R^2= 0.132**		**N= 1,950 -2 Log L = 1,213.71**	**N= 1,950 R^2 =0.020**	**N= 1,950 R^2 =0.022**

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

2. PI From New Fitreps

a. Descriptive Statistics

Table 6.15 provides the variable means by commissioning sources for PI, prior enlisted, female, and number of officers from each commissioning source and their percentages in O-1 through O-4 samples. The majority of new fitreps in the data file were submitted in 1999 and 2000 (see figure 4.3). During these two years, some cohorts in the MCCOAC file received the fitrep as an O-1, while some were evaluated as an O-4. Therefore, the PI models use observations from certain cohorts. For example, only the FY 1997 through 1999 cohorts are included in the new O1 PI sample, since earlier cohorts

were evaluated via the old fitreps. Similarly, the new O3 PI sample includes observations from the FY 1988 through 1996 cohorts that were evaluated as O-3's via the new fitrep. Officers used in each sample may have had one or more observed new fitreps at one grade, and the average PI derived from these fitreps does not reflect an officer's PI average for that grade because the rest of his or her fitreps are via old fitreps. However, as Table 6.15 displays, the matching of observations in the MCCOAC file with the new fitrep data produced a sufficient number of observations to analyze the new PI for each commissioning source. In general, distribution of the samples by commissioning sources is similar to the samples used in the above performance samples: USNA is 10 to 11 percent; NROTC is 15 to 20 percent; PLC and OCC account for 60 percent; and enlisted commissioning programs are 7 to 11 percent.

Table 6.15. Sample Means by Commissioning Source.

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP	Overall
O1 PI sample								
New O1PI	44.78	43.98	41.29	41.86	45.56	44.01	44.35	42.87
Prior Enlisted	0.099	0.066	0.191	0.639	1.0	1.0	1.0	0.467
Female	0.046	0.131	0.028	0.100	0.063	0.022	0.067	0.083
Number of Observations	203	275	356	748	144	90	90	1,906
Percentage of each comm. source in the total	0.107	0.144	0.187	0.393	0.076	0.047	0.047	
O2 PI sample								
New O2PI	48.01	49.11	47.10	48.36	51.80	50.51	54.59	48.55
Prior Enlisted	0.023	0.059	0.156	0.657	1.0	1.0	1.0	0.401
Female	0.095	0.095	0.020	0.133	0.042	0.016	0.058	0.077
Number of Observations	400	508	1,021	1,115	190	189	104	3,527
Percentage of each comm. source in the total	0.113	0.144	0.290	0.316	0.054	0.054	0.030	
O3 PI sample								
New O3PI	53.41	54.54	50.97	53.17	56.59	53.68		52.78
Prior Enlisted	0.042	0.058	0.118	0.561	1.0	1.0		0.257
Female	0.043	0.045	0.009	0.075	0.059	0.013		0.037
Number of Observations	622	1,066	2,116	1,105	254	154		5,317
Percentage of each comm. source in the total	0.117	0.201	0.398	0.208	0.048	0.029		
O4 PI sample								
New O4PI	62.27	61.07	59.92	60.37	61.01	59.26		60.51
Prior Enlisted	0.009	0.022	0.041	0.165	1.0	1.0		0.120
Female	0.029	0.032	0.003	0.101	0.025	0.013		0.033
Number of Observations	451	898	1,798	891	122	151		4,311
Percentage of each comm. source in the total	0.105	0.208	0.417	0.207	0.028	0.035		

b. O-1 and O-2 PI Estimates

Table 6.16 includes new O1 and O2 PI estimates for model 1 and model 2 using 1,906 and 3,527 observations, respectively. O1 and O2 regression model results reveal robust associations between variables using the new PI scores, which are now distributed normally.

Model 1 explains 8 and 6.6 percent of the variation in O1 and O2 PI. All variables are significant at the 10-percent or better level (except for commissioning age and some commissioning sources). Officers from PLC have 3.5 percentage points lower O1 PI, and one percentage point lower O2 PI, compared to USNA. OCC is associated with 2.59 percentage points lower O1 PI score, but it does not have any significant effect on O2 PI. MECEP, ECP, MCP, and NROTC graduates have between 0.95 to 5.7 percentage points higher O2 PI (relative to USNA), while none is significant in the O1 PI model. Prior enlisted positively affects O1 and O2 PI, but it is not significant in the O1 PI model. Both models find that married and female officers have significantly higher O1 and O2 PI scores.

Adding TBS performance and MOS in model 2 improves the explanatory power of the models by 4 and 13 percentage points. Model 2 finds that ethnicity does not affect O1 PI and O2 PI, except for the variable African American. Model 2 shows that being female and married positively affect PI. On the other hand, officers who had a combat fitrep (either as O-1 or O-2) had more than 7 percentage points higher average PI scores. A one percentage point increase in TBS class rank improves average O1 PI and O2 PI more than 0.05 percentage points. PLC and OCC graduates have significantly lower O1 PI scores. MECEP and ECP are the only significant commissioning programs that affect O2 PI. MECEP graduates have 1.85 percentage points higher O2 PI compared to USNA. The difference is 4.67 points in favor of ECP over USNA.

Table 6.16. OLS Estimates of O1 and O2 Performance Index Based on New Fitreps.

Variable	New O-1 PI			New O-2 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
Intercept	-	46.497 (2.279)	43.237 (2.279)	-	48.341 (2.033)	48.650 (1.917)
Married_O1/O2	0.267	0.715* (0.511)	0.407 (0.504)	0.428	0.883*** (0.344)	0.777*** (0.320)
Comm_age	24.40	0.002 (0.100)	- 0.024 (0.098)	24.02	0.004 (0.089)	- 0.037 (0.083)
Female	0.083	2.107*** (0.702)	2.189*** (0.716)	0.077	1.475*** (0.609)	1.391*** (0.585)
White (base case)	0.766			0.795		
Africaname	0.100	- 2.445*** (0.653)	- 1.256** (0.666)	0.090	- 1.985*** (0.567)	- 1.403*** (0.542)
Hispanic	0.079	- 1.416** (0.721)	- 0.736 (0.717)	0.067	- 1.119** (0.646)	- 0.487 (0.604)
Otherrace	0.056	- 0.167 (0.841)	0.119 (0.829)	0.048	- 1.108* (0.747)	- 0.660 (0.693)
Combat Fitrep O1 / O2	0.003	7.207** (3.435)	7.249** (3.374)	0.013	7.715*** (1.452)	7.439*** (1.301)
TBS Overall Class Rank Percentile	48.65	N.A.	0.056*** (0.007)	49.55	N.A.	0.062*** (0.006)
Combat_MOS (base case)	0.389			0.337		
Grsupport_MOS	0.285	N.A.	0.263 (0.482)	0.246	N.A.	- 0.340 (0.402)
Service_MOS	0.197	N.A.	2.659*** (0.557)	0.175	N.A.	2.173*** (0.457)
Aviation_MOS	0.036	N.A.	- 0.930 (1.033)	0.144	N.A.	- 9.526*** (0.479)
Avsupport_MOS	0.109	N.A.	- 0.260 (0.664)	0.100	N.A.	- 1.985*** (0.542)
Priorenl	0.467	0.524 (0.561)	0.656 (0.552)	0.401	0.658* (0.477)	0.037 (0.442)
USNA (base case)	0.107			0.113		
NROTC	0.144	-0.793 (0.776)	- 0.341 (0.763)	0.144	0.951* (0.632)	0.388 (0.587)
PLC	0.187	- 3.527*** (0.749)	- 3.032*** (0.740)	0.290	- 1.030** (0.567)	- 0.295 (0.528)
OCC	0.393	- 2.595*** (0.777)	- 1.701** (0.773)	0.316	- 0.157 (0.644)	0.082 (0.603)
MECEP	0.076	0.976 (1.127)	0.307 (1.108)	0.054	2.944*** (0.991)	1.859** (0.918)
ECP	0.047	- 0.975 (1.257)	- 0.967 (1.235)	0.054	1.703** (0.986)	1.021 (0.914)
MCP	0.047	- 0.548 (1.271)	- 1.351 (1.253)	0.030	5.717*** (1.186)	4.671*** (1.098)
Comm_FY1995 (base case for O2 model)	-			0.175		
Comm_FY 1996	-			0.331	- 1.164*** (0.473)	- 1.798*** (0.438)
Comm_FY 1997 (base case for O1 model)	0.337			0.273	- 0.883** (0.492)	- 2.075*** (0.458)

Table 6.16. OLS Estimates of O1 and O2 Performance Index Based on New Fitreps (Cont.)

Variable	New O-1 PI			New O-2 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
Comm_FY 1998	0.500	- 2.872*** (0.435)	- 2.833*** (0.427)	0.221	- 0.053 (0.520)	- 2.258*** (0.491)
Comm_FY 1999	0.163	- 4.362*** (0.604)	- 4.264*** (0.592)			
PI	42.868			48.545		
		N= 1,906 R^2 =0.080	**N= 1,906 R^2= 0.119**		**N=3,527 R^2 =0.046**	**N=3,527 R^2 =0.187**

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

c. O-3 and O-4 PI Estimates

Table 6.17 includes model 1 and model 2 estimates for O3 and O4 PI, as well as the variable means for 5,317 and 4,311 observations, respectively. Model 1 explains 6 percent of the variation in O3 PI, and 13.3 percent of the variation in O4 PI. Married (at O-3 or O-4) and being female positively affect PI at both grades. Commissioning age and prior enlisted have a significant impact on O3 PI, but not on O4 PI. Officers who were one year older at accession had 0.17 percentage point lower O3 PI, whereas prior enlisted officers had 1.5 percentage points higher average O3 PI score. O3 and O4 model 1 results show that PLC, OCC and ECP graduates have significantly lower average PI, but ECP is not significant in the O-3 model. MECEP graduates have 1.5 percentage points higher O3 PI relative to USNA, but the difference is not significant in the O-4 model. Other than African Americans, ethnicity does not affect O3 or O4 PI: African Americans had lower O3 and O4 PI scores.

Model 2 explains 12 and 15 percent of the variation in O3 and O4 PI. Model 1 results for marital status, female, minority, commissioning age, and prior enlisted are consistent with the findings of Model 2. Being married and being female positively affect PI , whereas being African American has a negative association. Commissioning age and prior enlisted are still significant in model 2 of O3 PI, and not significant in O4 PI. Model 2 also show that officers who had at least one combat fitrep as O3 or O4 or who served in joint duties as O4 had significantly higher PI scores. The negative impact of PLC and OCC stays significant in Model 2. In addition, Model 2 also

finds that officers from other commissioning sources have lower O3 and O4 PI's compared to USNA. However, NROTC and MECEP are not significant in the O3 PI model.

Table 6.17. OLS Estimates of O3 and O4 Performance Index Based on New Fitreps.

Variable	New O-3 PI			New O-4 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
Intercept	-	57.904 (2.391)	56.934 (2.337)	-	57.007 (2.715)	55.518 (2.704)
Married_O3/O4	0.624	0.961*** (0.294)	1.168*** (0.287)	0.685	5.809*** (0.338)	5.468*** (0.339)
Comm_age	23.51	- 0.170** (0.089)	- 0.187** (0.086)	23.06	- 0.041 (0.111)	- 0.084 (0.110)
Female	0.037	2.634*** (0.766)	1.983*** (0.756)	0.033	2.829*** (0.888)	2.054** (0.903)
White (base case)	0.856			0.905		
Africaname	0.057	- 1.355** (0.612)	- 1.007** (0.607)	0.042	- 1.914*** (0.773)	- 1.048* (0.779)
Hispanic	0.047	- 0.410 (0.666)	- 0.195 (0.646)	0.027	- 0.724 (0.949)	- 0.232 (0.942)
Otherrace	0.040	- 0.371 (0.714)	- 0.606 (0.690)	0.026	- 1.101 (0.978)	- 1.111 (0.967)
Combat Fitrep O3 / O4	0.036	- 0.258 (0.757)	1.883*** (0.744)	0.021	3.388*** (1.075)	3.693*** (1.070)
Joint_O4	-			0.087	7.198*** (0.556)	7.054*** (0.552)
TBS Overall Class Rank Percentile	52.08	N.A.	0.053*** (0.005)	55.25	N.A.	0.052*** (0.006)
Combat_MOS (base case)	0.277			0.295		
Grsupport_MOS	0.151	N.A.	1.096*** (0.440)	0.176	N.A.	0.003 (0.462)
Service_MOS	0.135	N.A.	1.075** (0.463)	0.135	N.A.	1.354*** (0.517)
Aviation_MOS	0.367	N.A.	-5.079*** (0.357)	0.321	N.A.	- 1.447*** (0.396)
Avsupport_MOS	0.070	N.A.	- 0.069 (0.570)	0.086	N.A.	- 0.016 (0.582)
Priorenl	0.257	1.496*** (0.445)	0.700* (0.431)	0.120	- 0.180 (0.751)	- 0.500 (0.745)
USNA (base case)	0.117			0.105		
NROTC	0.201	0.357 (0.519)	- 0.371 (0.503)	0.208	- 0.716 (0.586)	- 1.036** (0.581)
PLC	0.398	- 2.711*** (0.469)	- 1.623*** (0.459)	0.417	- 1.614*** (0.540)	- 1.506*** (0.535)
OCC	0.208	- 1.330*** (0.568)	- 0.954** (0.554)	0.207	- 1.234** (0.643)	- 1.007* (0.637)
MECEP	0.048	1.535** (0.908)	- 0.134 (0.882)	0.028	- 0.678 (1.257)	- 2.050* (1.250)

Table 6.17. OLS Estimates of O3 and O4 Performance Index Based on New Fitreps (Cont.)

Variable	New O-3 PI			New O-4 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
ECP	0.029	- 0.688 (1.030)	- 1.434* (0.999)	0.035	- 2.837*** (1.196)	- 3.207*** (1.184)
Comm_FY 1980 (base case for O4 model)	-			0.019		
Comm_FY 1981	-			0.031	0.500 (1.412)	0.899 (1.398)
Comm_FY 1982	-			0.078	1.305 (1.240)	1.737* (1.227)
Comm_FY 1983	-			0.155	2.517** (1.179)	2.548** (1.167)
Comm_FY 1984	-			0.121	2.271** (1.197)	2.366** (1.184)
Comm_FY 1985	-			0.121	1.820* (1.197)	1.843* (1.184)
Comm_FY 1986	-			0.129	1.376 (1.192)	1.503 (1.179)
Comm_FY 1987	-			0.116	0.396 (1.204)	0.583 (1.191)
Comm_FY 1988 (base case for O3 model)	0.014			0.102	- 0.428 (1.215)	- 0.052 (1.203)
Comm_FY 1989	0.092	0.382 (1.273)	0.673 (1.228)	0.091	- 1.576* (1.229)	- 1.343 (1.217)
Comm_FY 1990	0.119	1.106 (1.253)	1.025 (1.209)	0.036	- 0.713 (1.377)	- 0.439 (1.362)
Comm_FY 1991	0.157	0.717 (1.239)	0.650 (1.196)	-		
Comm_FY 1992	0.173	0.194 (1.238)	0.037 (1.195)	-		
Comm_FY 1993	0.147	- 1.533 (1.242)	- 1.451 (1.199)	-		
Comm_FY 1994	0.147	- 3.326*** (1.241)	- 3.297*** (1.198)	-		
Comm_FY 1995	0.112	- 3.857*** (1.258)	- 4.233*** (1.214)	-		
Comm_FY 1996	0.039	- 0.725 (1.380)	- 1.809* (1.333)	-		
PI	52.775			60.505		
		N= 5,317 R^2 =0.061	**N= 5,317 R^2= 0.126**		**N=4,311 R^2 =0.133**	**N=4,311 R^2 =0.154**

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

F. SUMMARY

This Chapter presented the multivariate regression results of the five performance measures. The findings indicate that commissioning source is an important determinant

of performance in the Marine Corps. TBS and PI models are estimated by OLS regression, whereas Heckman two-step procedure is applied in O3 and O4 PI analyses. The results of TBS academic, leadership, and military class rank OLS regression are included in Appendix D. The Heckman model estimations show that captains and majors (O-3 and O-4) who do not stay until the promotion point had lower PI scores based on the old fitreps, but the difference is not significant for majors. The Heckman procedure is not used in the new PI models because the new fitrep data set provides records for only two years –1999 and 2000- which is not enough to analyze retention decisions at O-3 and O-4 ranks. The logit model is used to estimate retention to the 10-year point. O-4 and O-5 promotion models are estimated both by simple probit and bivariate probit with sample selection techniques. The bivariate probit model finds that officers who left before the O-4 and O-5 promotion point are associated with lower promotions rates, and simple probit models have downward bias. Controlling for survival to O-5, bivariate probit results indicate that MECEP and ECP officers who leave earlier have significantly lower O-5 promotion rates. The next chapter includes a summary of the study, presents conclusions, and provides recommendations.

VII. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

The study attempts to identify and evaluate the effects of officer commissioning programs on the career development of U.S. Marine Corps officers. The study also analyzes the effects of other groups of factors on career success, including personal characteristics, cognitive human capital, and affective skills. Chapter II describes the Marine Corps officer accession programs, the Basic School (TBS), and the Marine Corps' promotion and performance evaluation system, which was completely changed in 1999. Literature on performance at TBS, retention, and promotion is reviewed in Chapter III. Prior studies have generally focused on the effects of minority status and graduate education on these success criteria. On the other hand, most of these studies also have included officer accession sources often grouped into a few categories. However, I think that each commissioning program is unique in the way that pre-entry military acculturation is provided, and such groupings may conceal significant associations between each commissioning program and various success criteria.

Three data files used in the study are described in Chapter IV. Prepared by CNA, the MCCOAC file is an event-based data set derived from longitudinal Marine Corps officer data files, and includes more than 28,000 Marines accessed between FY 1980 and 1999. The MCCOAC file provides the major data for this study. Old and new fitrep data are merged with the MCCOAC file by matching SSN's. Chapter IV describes samples for the five basic performance models analyzed in the study: performance at TBS; retention to 10 YCS; O-4 promotion; O-5 promotion; Performance Index (PI). Derived from old and new fitreps, PI is used as a performance measure in the study and captures average PI at O-1 through O-4 grades. Also in Chapter IV, dependent and explanatory variables are introduced and analysis of variance (ANOVA) tests are conducted to find any significant difference in performance measures among officers from seven accession sources. Results indicate that the differences in mean TBS class rank, retention to 10-year, O-4 and O-5 promotion rates, and Performance Index scores among the accession sources are statistically significant.

Chapter V includes multivariate model specifications and establishes hypothesized relationships between explanatory and dependent variables. Performance at TBS and Performance Index models use ordinary least squares (OLS) techniques. The O-3 and O-4 PI models apply Heckman two-step procedure to correct for sample selection bias. Retention to 10-year is estimated via a non-linear logit equation. Both simple probit and bivariate probit with sample selection correction are used to estimate the O-4 and O-5 promotion models. The bivariate probit models correct for any sample selection bias that might arise from the possibility that officers who left before the promotion point are not a representative sample of the remaining officer group. Chapter VI contains the regression results of the models for each performance measure.

B. CONCLUSIONS

Chapter VI includes results of the 18 regression models for the five basic performance measures. The results show that some variables are highly significant in all models. On the other hand, the signs and significance of some variables change from one model to another, which makes generalization more difficult. To make interpretation easier, this section compiles the sign, magnitude, and significant key variables. In doing so, the performance criteria are placed in an order to be in line with the career progression of a Marine officer, which is TBS performance, O2 PI, retention to 10-year, O-3 PI, O-4 promotion, O4 PI, O-5 promotion.

As Chapter VI explained, including TBS class rank and MOS information in model 2 for the retention, promotion, and PI models increased the models' explanatory power. Similarly, model 2 for TBS performance included GCT information, which increased R^2 5 to 10 percentage points. Therefore, Tables 7.2 and 7.3 below include coefficients and derivatives from model 2 explained in Chapter VI. However, we know that commissioning source significantly affects TBS performance. So, in model 2 we expect coefficients of commissioning sources to be smaller (because it only reflects the direct effect of commissioning source). In model 1, we expect coefficients of commissioning sources to be larger because they reflect both the direct and indirect effect of source. Since the focus of this study is to analyze the effect of commissioning source, model 1 results serve this purpose better. Therefore, Table 7.1 contains coefficients and derivatives from model 1 from Chapter VI. In the tables, the values below the retention

column (col. 3) and promotion columns (col. 5 and 7) represent derivatives (dp/dx) from non-linear estimations. O-4 and O-5 promotion results are obtained from the bivariate probit with sample selection models. The PI columns (col. 2, 4, 6) contain old and new fitness report results, the first lines coming from the old report estimates, and the second lines from the new fitness reports.

Table 7.1 includes the effects of commissioning sources. Prior enlisted is also included in Table 7.1 because it is directly related to enlisted commissioning programs (MECEP, ECP, and MCP), and should be interpreted together with them.

Table 7.1. Multivariate Regression Results for Commissioning Sources.

	TBS overall class rank (% Rank)	O2 PI (%Perc.Points)	Retention to 10-year (%Perc.Points)	O3 PI (%Perc.Points)	O-4 Prom. (%Perc.Points)	O4 PI (%Perc.Points)	O-5 Prom. (%Perc.Points)
USNA (base case)	-	-	-	-	-	-	-
NROTC	2.7***	- 0.22*** 0.95*	N.S.	- 0.47*** N.S.	7.5***	- 0.12* N.S.	9.4**
PLC	- 1.0*	- 0.52*** - 1.03**	-3.9**	- 0.77*** - 2.71***	10.0***	- 0.12* - 1.61***	6.3**
OCC	- 4.9***	- 0.46*** N.S.	- 10.5***	- 0.85*** - 1.33***	13.9***	N.S. - 1.23**	N.S.
MECEP	16.5***	0.35** 2.94***	15.0***	-1.28*** 1.54***	N.S.	N.S. N.S.	21.1***
ECP	4.1***	- 0.25* 1.70**	N.S.	-1.19*** N.S.	9.1***	- 0.32** - 2.84***	25.0***
MCP	13.7***	N.S. 5.72***	N.A.	N.A.	N.A.	N.A.	N.A.
Prior Enlisted	3.3***	0.21*** 0.66*	6.7***	- 0.528*** 1.50***	N.S.	N.S. N.S.	- 27.5***

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level

Perc. Points = Percentage Points; N.S.= Not Significant; N.A.= Not Applicable

The results indicate that NROTC graduates' performance is not much different from USNA graduates' performance. NROTC graduates have higher TBS overall class ranks, whereas their O2 through O4 PI scores are slightly lower. NROTC does not affect 10-year retention, but increases O-4 and O-5 promotion rates by 7.5 and 9.4 percentage points, respectively (relative to USNA).

Compared to USNA and NROTC, PLC graduates have a lower career performance profile except for O-4 and O-5 promotion. They have significantly lower

TBS overall class rank, average PI scores at O-1 through O-4 grades, and 10-year retention probabilities. The two points where PLC officers out-perform USNA graduates are O-4 and O-5 promotions, which favors PLC by 10 and six percentage points, respectively.

OCC graduates' performance profile is similar to but below that of PLC graduates. OCC graduates consistently perform poorer than USNA graduates at all career points except at O-4 promotion. OCC graduates' 10-year retention rate is 10.5 percentage points lower than USNA and 6.5 percentage points lower than PLC graduates. However, like PLC, OCC has a positive effect on O-4 promotion. OCC graduates have 14 percentage points higher O-4 promotion rates (relative to USNA).

MECEP graduates perform significantly better than USNA graduates at TBS having a 16.5 percentile points higher overall class rank. MECEP graduates also have better PI scores as O-1's and O-2's, and their 10-year retention rate is also the highest among all commissioning sources (22 percentage points higher when combined with the effect of being prior enlisted). However, based on old fitreps, they have 1.8 percentage points lower PI scores as captains (when combined with the prior enlisted effect). MECEP does not make any difference on O-4 promotion probability. As O-4's, MECEP graduates do not perform differently from USNA graduates; however, their O-5 promotion probability is 6.5 percentage points lower than USNA graduates (when combined with the effect of being prior enlisted).

ECP graduates' performance at TBS is better than that of USNA graduates. Their 10-year retention rate is also higher (via the positive effect of prior enlisted). The results indicate some interesting findings for ECP after this point. Officers from ECP consistently have lower average PI scores at grades O-1 through O-4. However, their lower fitrep grades do not appear to damage their O-4 and O-5 promotion success. ECP graduates' O-4 promotion rate is nine percentage points higher than USNA graduates, while they have the smallest negative association with O-5 promotion as an enlisted commissioning source graduate group.

The analysis for MCP is limited to TBS performance and PI at O-1 and O-2 (because of insufficient observations). The results show that MCP graduates are more

successful at TBS and obtain 5.7 percentage points higher average O-2 PI scores based on new fitreps.

In conclusion, the study results show that USNA graduates do not perform as well as enlisted commissioning program graduates at TBS. USNA is also negatively associated with O1 and O2 PI as well as 10-year retention compared to MECEP and ECP. However, Academy graduates receive better performance marks at O-3 and O-4 grades relative to all other commissioning program graduates. In spite of other commissioning program graduates' (except for MECEP) lower performance before the O-4 promotion board, the results find that these commissioning programs have significantly higher O-4 promotion rates.

As the North and Goldhaber study (1995) indicates, TBS performance is a very significant career performance predictor. The results here show that higher TBS class rank is associated with better performance in all models. Table 7.2 summarizes the model 2 regression results for TBS overall class rank as a predictor of later career outcomes. The results reveal that an officer who graduated at the top of his class at TBS has 2.5 to 3 percentage points higher PI scores based on new fitreps. Also, a one-percentile point increase in the TBS class rank increases O-4 and O-5 promotion rates by more than 0.25 percentage points; the difference is almost 10-percentage point between a top performer at TBS and one at the 50^{th} percentile. Note that as TBS class rank regression results indicated, officers from enlisted commissioning programs are positively associated with higher TBS class ranks, whereas OLC and PLC have negative associations. Therefore, when used as an explanatory variable, TBS performance brings an indirect effect into these success models that favor enlisted commissioning programs.

Table 7.2 also incorporates the effect of being married on the performance measures in the second row. The results find that marital status is another variable that is consistently associated with higher career performance. Married officers had two percentage points higher TBS class rank, and 0.8 to 5.5 percentage points better PI scores based on the new fitrep at O-2 through O-4 grades. Being married at accession improves retention by 7.7 percentage points. Also, married officers had 2.7 and 7.2 percentage points higher O-4 and O-5 promotion rates, respectively.

Table 7.2. Multivariate Regression Results for TBS overall class rank and Marital Status.

	TBS overall class rank (% Rank)	O2 PI (%Perc.Points)	Retention to 10-year (%Perc.Points)	O3 PI (%Perc.Points)	O-4 Prom. (%Perc.Points)	O4 PI (%Perc.Points)	O-5 Prom. (%Perc.Points)
TBS Overall Class Rank	-	0.03*** 0.06***	0.16 ***	0.02*** 0.05***	0.30 ***	0.002*** 0.05***	0.26 ***
Married	2.04 ***	0.30 *** 0.78***	7.69***	0.28*** 1.17***	2.72 ***	0.16** 5.47 ***	7.23**

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level
Perc. Points = Percentage Points

Table 7.3 summarizes the regression results for minority status and gender. The results show that minorities are negatively associated with performance at TBS, even after controlling for GCT. African Americans' 10-year retention rates are 3.3 percentage points higher relative to majority officers. In all models, controlling for TBS performance and MOS type eliminates the negative effect of minority status. However, African Americans still have significantly lower O-2 and O-3 PI scores. Similar to minorities, females perform poorer than their male counterparts at TBS. However, the results show that female officers' performance is significantly better in all subsequent phases except for O-5 promotion. Being female is positively associated with PI based on new fitreps (by 1.4 to 2 percentage points). Females also have four percentage points higher 10-year retention, and 5.9 percentage points higher O-4 promotion rates.

Table 7.3. Multivariate Regression Results for Minority Status.

	TBS overall class rank (% Rank)	O2 PI (%Perc.Points)	Retention to 10-year (%Perc.Points)	O3 PI (%Perc.Points)	O-4 Prom. (%Perc.Points)	O4 PI (%Perc.Points)	O-5 Prom. (%Perc.Points)
White (base case)							
African American	-19.65***	- 0.80*** - 1.40***	3.29*	- 0.28** - 1.01**	N.S	N.S. - 1.05*	N.S.
Hispanic	-10.61***	N.S. N.S.	N.S.	N.S N.S	N.S	N.S N.S	N.S.
Other Race	-7.34 ***	- 0.22** N.S.	N.S.	N.S N.S	N.S	N.S N.S	N.S.
Female	-8.98 ***	0.37*** 1.39***	3.96**	N.S 1.98***	5.92**	N.S. 2.05 *	N.S.

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level
Perc. Points = Percentage Points; N.S.= Not Significant

Figure 7.1 includes observed average career progression rates of Marine officers by commissioning source. The sample size is limited to the FY 1980-1983 (N= 5,954)

cohorts in order to capture the O-5 promotion point. As the figure shows, the retention rates of enlisted commissioning program graduates to the O-4 point are 10 to 25 percentage points higher than other sources. After the O-4 promotion point, nearly 30 percent of the entry cohorts of USNA, NROTC, PLC and OCC graduates remain in service, whereas 45 percent of MECEP and ECP graduates remain. However, MECEP graduates' retention at O-4 is lower than that of the other accession programs. 22 percent of the MECEP entrants do not stay to the O-5 promotion point, while other commissioning programs lose 4 to 5 percent at O-4. At the O-5 point, USNA, NROTC, PLC, and OCC graduates lose nearly eight percent of the their entry cohort. Figure 7.1 shows that 23 percent of USNA graduates remain in service as O-5's. Losing between 10 and 15 percent at O-5 promotion, MECEP and ECP entry cohort drops to 14 and 24 percent at O-5 point.

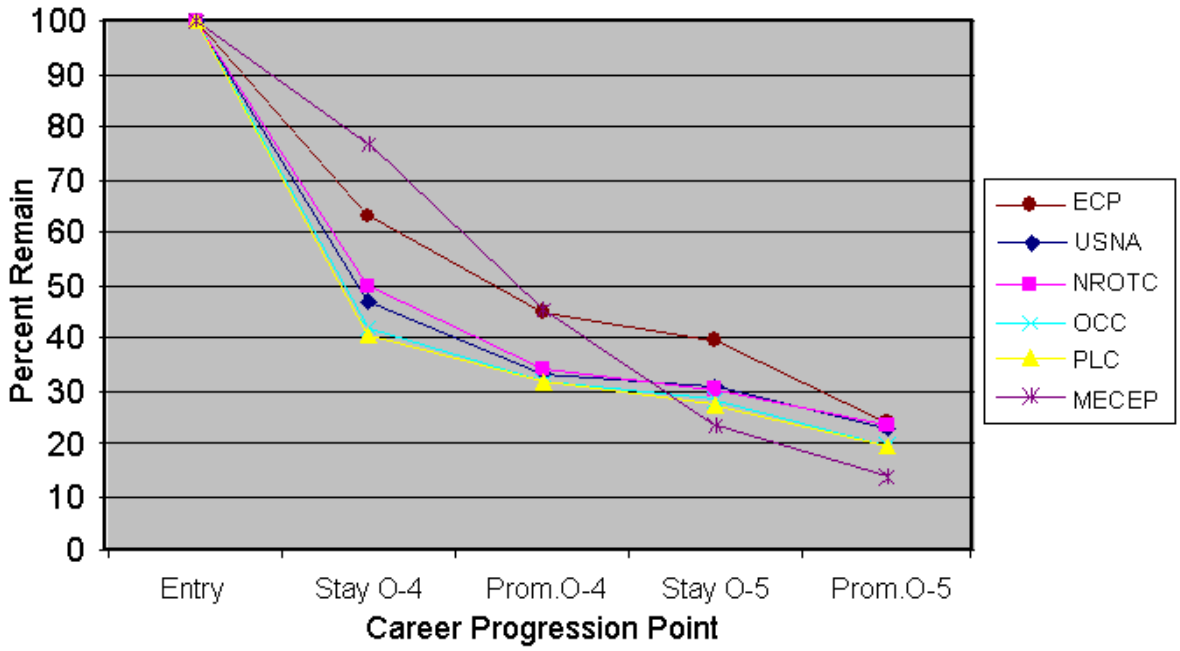

Figure 7.1. Career Progression of Marine Officers By Commissioning Source/Observed.

Figure 7.2 displays the predicted probabilities at career progression points for each commissioning source. Note that the base case in the estimations includes USNA graduate, white, and single officers from the FY 1980 cohort. The derivatives obtained from model 1 promotion estimations from Chapter VI are added to the base case

predicted probabilities to calculate the progression rate for each commissioning source. The survival to O-4 model underestimates retention relative to the actual rates. Note that 10 to 20 percent difference between retention to O-4 and O-4 promotion points indicates the significance of O-4 promotion as the 'up or out point' for all groups. MECEP decreases retention rates at O-4 by almost 50 percent. The results reveal that for 100 entrants from NROTC and ECP programs the yield is 29 O-5's. The yield rate for PLC and OCC programs are 25 and 26 percent, respectively, whereas 23 out of 100 USNA graduates make O-5. Finally, enlisted commissioning program graduates, especially MECEP graduates are more likely to stay to O-4 board, and less likely to promote to field grades.

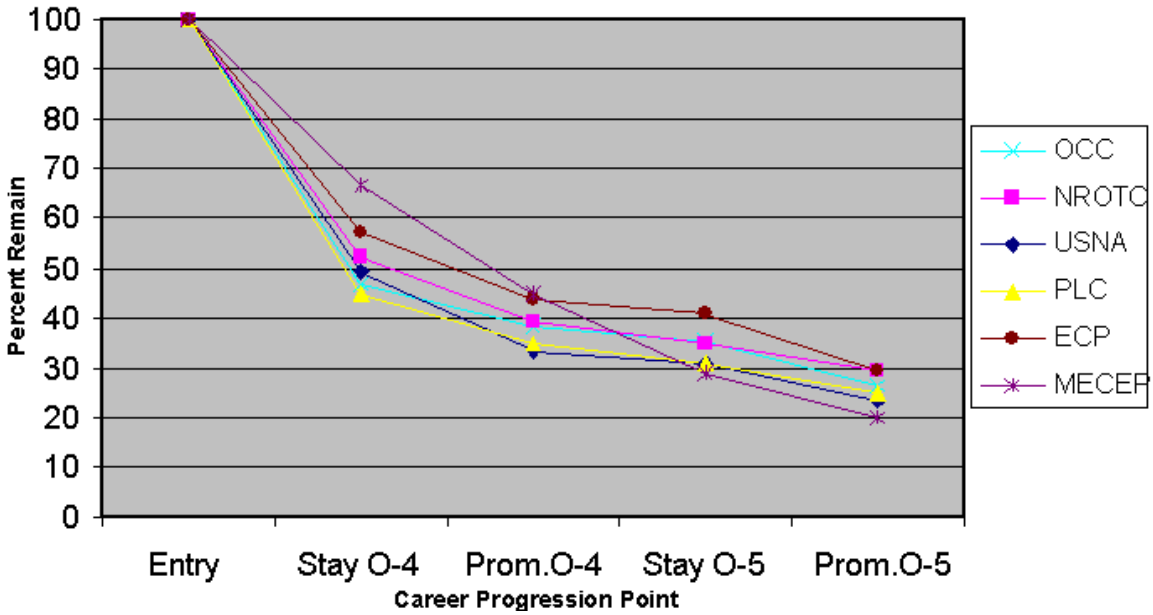

Figure 7.2. Career Progression of Marine Officers By Commissioning Source/Predicted.

C. RECOMMENDATIONS

The study results find that MECEP graduates' 10-year retention rates are 17 percentage points higher than USNA graduates. The difference gets bigger when the positive effect of being prior enlisted is added (21.7 percentage points). However, the bivariate probit results show that MECEP graduates O-4 promotion rates are not different than USNA graduates. The negative impact of prior enlisted is considerably high, 27.5 percentage points (40 percent) at O-5 promotion point. However, MECEP and ECP have

a positive and significant effect at O-5 promotion that reduces the negative impact of prior enlisted. MECEP and ECP graduates have 6.5 and 2.5 percentage points lower O-5 promotion rates compared to USNA, but 31 and 37 percent higher compared to prior enlisted officers from other commissioning sources.

Finding similar association between enlisted commissioning programs and O-5 promotion, North and Goldhaber (1995, p. 48) points out to a couple of reasons. One of them is related to promotion boards: " …board members [O-5] may not want to take a chance on an officer who may retire."[12] However, the bivariate O-4 and O-5 promotion model results of this study indicate two points: (1) Prior enlisted officers are 41 percent less likely to be promoted to O-5; (2) enlisted commissioning programs have an additional effect on O-5 promotions that reduces the first negative impact. Another reason for the negative effect of prior enlisted service is that being eligible for retirement prior enlisted officers may have lower motivation to perform at field grades. However, as Table 7.1 summarized, although ECP is negatively associated with O-4 PI scores compared to USNA, MECEP and prior enlisted officers do not have lower fitness report grade averages than OCC or PLC graduates. Finally, as O-4's all officers will be eligible for retirement even if they are not promoted to O-5 (As noted in Chapter II, O-4's are allowed to stay until 20 years point if not promoted to O-5). The Marine Corps might consider further research to examine the negative association between both enlisted commissioning programs, and prior enlisted officers and the O-5 promotion process.

Another point that is related to field grade promotion process is the significant and positive effect of PLC and OCC programs on O-4 promotion. In concert with expectations, PLC and OCC graduates, who have relatively less military training and less exposure to military life, are expected to perform poorly at junior grades compared to USNA and enlisted commissioning program graduates. As the results indicate they do; however, as opposed to their lower average O-3 PI scores, PLC and OCC graduates have 10 and 14 percentage points higher O-4 promotion rates. As noted before, these two sources provide approximately 60 percent of each cohort and the promotion models

[12] The authors find that "officers with military experience before commissioning were no or less likely to be promoted [to O-4] (1995, p. 97). However their O-5 promotion results do not include a variable indicating prior enlisted experience.

explain 5-6 percent of the variation in dependent variable. Hence, other factors that the models omit may explain such a positive association. Future researchers and the Marine Corps may find it valuable to identify the factors correlated with PLC and OCC graduates' higher O-4 promotion rates.

The PI regression results find that USNA graduates have higher PI scores at all grades between O-1 and O-4 compared to officers from other commissioning sources (except for MECEP at O1 and O2 PI). However, USNA graduates have the lowest third TBS overall class rank order, before PLC and OCC graduates. Although USNA graduates are exposed to military life more extensively than NROTC and PLC graduates, NROTC officers have 2.7 percentile points higher class ranks at TBS (compared to USNA graduates), and the difference between USNA and PLC graduates is slight. In addition, the multivariate results show that there is an unexplained negative association between minorities and TBS performance. The TBS regression results support the findings of North and Smith (1993) on the negative effect of minority status at TBS. The results show that both females and minorities have 7 to 20 percentage points lower overall TBS class ranks even after background characteristics (e.g., GCT score) are controlled. The Marine Corps might be interested in examining the reasons for USNA graduates' and minorities' poor performance at TBS (for one explanation see Finley, 2002).

Expecting that retention decisions are associated with career performance, the PI and promotion models used Heckman and Bivariate probit models with sample selection. The O-3 and O-4 PI model assume that officers who leave as O-3's or O-4's have lower fitness report marks compared to those who stay to the O-4 and O-5 promotion boards. The results find that the Inverse Mills ratio (λ) is negative in both models but not significant in the O-5 PI model. When we compare the Heckman model results to the OLS results that do not control for selection (See Appendix F) we see that the coefficients of commissioning programs are understated in the latter model, as we expected.

Another technique to correct for sample selection bias via retention decisions is bivariate probit model, which is used in the O-4 and O-5 promotion models. In both promotion models, the rho term is significant which indicates a negative correlation

between the error terms of the retention and promotion equations. The significant rho also reveals that O-4 and O-5 promotions estimated by simple probit are biased. Controlling for sample selection bias, the bivariate probit results find that coefficients of commissioning sources get larger and more significant. In other words, the coefficients estimated by simple probit are biased downward.

D. LIMITATIONS

The MCCOAC file is a comprehensive personnel file that includes 28,058 Marines from the FY 1980 through 1999 cohorts. However, prior enlisted information is not included in the data set. Prior enlisted information obtained from the Marine Corps did not include branch of Service, which prior studies here found to be significant in explaining TBS performance. The second deficiency in the data set is the absence of college major, SAT and GCT information. More than 6,000 observations have 'no college major indicated.' Missing GCT scores also lead to exclusion of four cohorts from the TBS performance analysis. Also postgraduate education records that include PME and master's degrees would improve the quality of research in officer performance.

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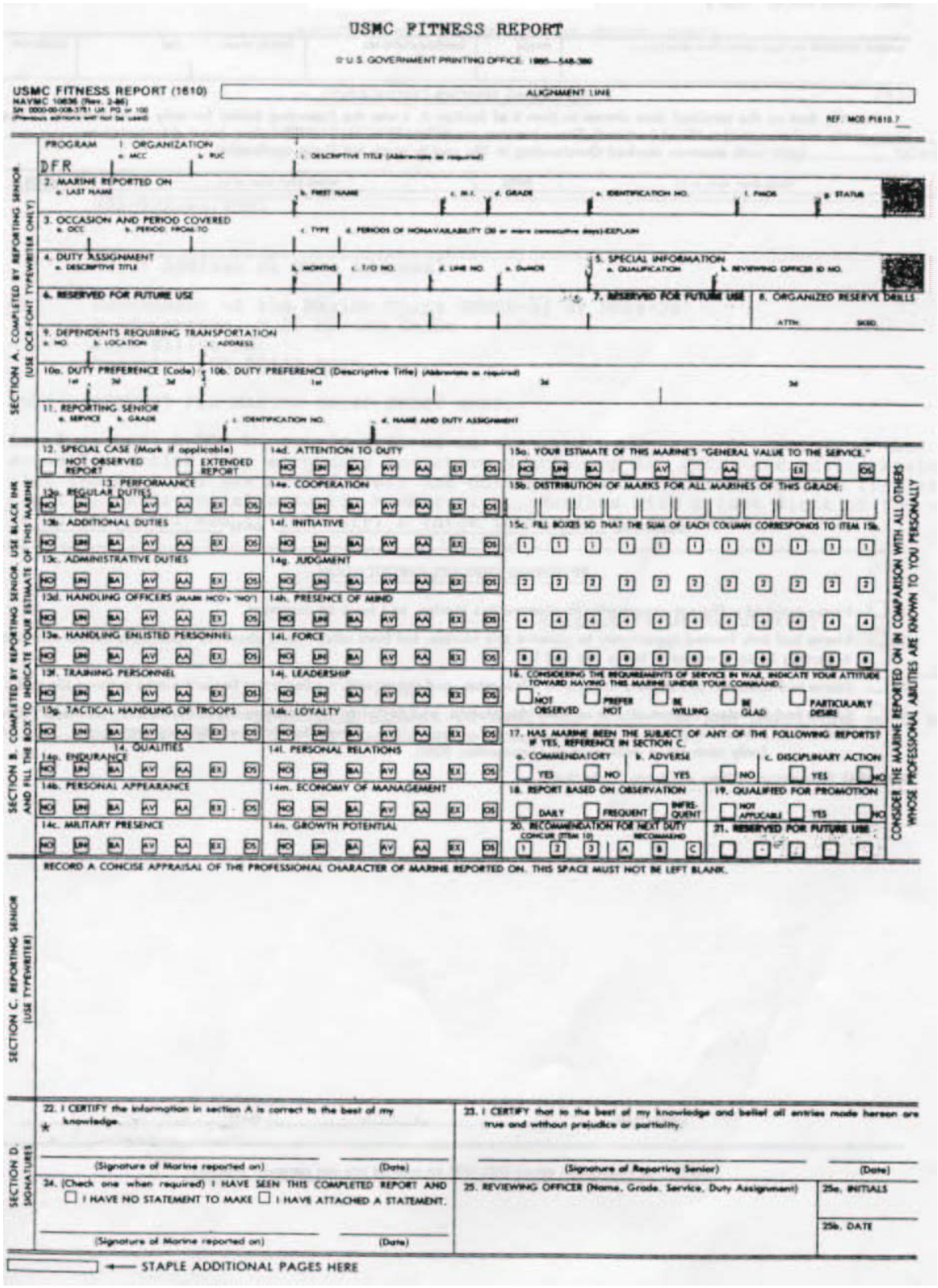
APPENDIX A. USMC FITNESS REPORT: PRIOR TO 1999



USMC FITNESS REPORT

☆ U.S. GOVERNMENT PRINTING OFFICE: 1985—548-386

USMC FITNESS REPORT (1610)
NAVMC 10836 (Rev. 2-85)
SN 0000-00-008-3761 (All PFD or 100)
(Previous editions will not be used)

ALIGNMENT LINE

REF: MCO P1610.7

SECTION A. COMPLETED BY REPORTING SENIOR (USE OCR-FONT TYPEWRITER ONLY)

PROGRAM 1. ORGANIZATION a. MCC b. RUC c. DESCRIPTIVE TITLE (Abbreviate as required)
DFR
2. MARINE REPORTED ON a. LAST NAME b. FIRST NAME c. M.I. d. GRADE e. IDENTIFICATION NO. f. PMOS g. STATUS
3. OCCASION AND PERIOD COVERED a. OCC b. PERIOD: FROM-TO c. TYPE d. PERIODS OF NONAVAILABILITY (30 or more consecutive days)-EXPLAIN
4. DUTY ASSIGNMENT a. DESCRIPTIVE TITLE b. MONTHS c. T/O NO. d. LINE NO. e. DutMOS
5. SPECIAL INFORMATION a. QUALIFICATION b. REVIEWING OFFICER ID NO.
6. RESERVED FOR FUTURE USE
7. RESERVED FOR FUTURE USE
8. ORGANIZED RESERVE DRILLS ATTN: SKED:
9. DEPENDENTS REQUIRING TRANSPORTATION a. NO. b. LOCATION c. ADDRESS
10a. DUTY PREFERENCE (Code) 1st 2d 3d 4
10b. DUTY PREFERENCE (Descriptive Title) (Abbreviate as required) 1st 2d 3d
11. REPORTING SENIOR a. SERVICE b. GRADE c. IDENTIFICATION NO. d. NAME AND DUTY ASSIGNMENT

SECTION B. COMPLETED BY REPORTING SENIOR. USE BLACK INK AND FILL THE BOX TO INDICATE YOUR ESTIMATE OF THIS MARINE

12. SPECIAL CASE (Mark if applicable) ☐ NOT OBSERVED REPORT ☐ EXTENDED REPORT
13. PERFORMANCE
13a. REGULAR DUTIES
13b. ADDITIONAL DUTIES
13c. ADMINISTRATIVE DUTIES
13d. HANDLING OFFICERS (MARK NCO's "NO")
13e. HANDLING ENLISTED PERSONNEL
13f. TRAINING PERSONNEL
13g. TACTICAL HANDLING OF TROOPS
14. QUALITIES
14a. ENDURANCE
14b. PERSONAL APPEARANCE
14c. MILITARY PRESENCE
14d. ATTENTION TO DUTY
14e. COOPERATION
14f. INITIATIVE
14g. JUDGMENT
14h. PRESENCE OF MIND
14i. FORCE
14j. LEADERSHIP
14k. LOYALTY
14l. PERSONAL RELATIONS
14m. ECONOMY OF MANAGEMENT
14n. GROWTH POTENTIAL
(NO LIM BA AV AA EX OS)
15a. YOUR ESTIMATE OF THIS MARINE'S "GENERAL VALUE TO THE SERVICE." (NO LIM BA ☐ AV ☐ AA ☐ EX ☐ OS)
15b. DISTRIBUTION OF MARKS FOR ALL MARINES OF THIS GRADE:
15c. FILL BOXES SO THAT THE SUM OF EACH COLUMN CORRESPONDS TO ITEM 15b.
16. CONSIDERING THE REQUIREMENTS OF SERVICE IN WAR, INDICATE YOUR ATTITUDE TOWARD HAVING THIS MARINE UNDER YOUR COMMAND. ☐ NOT OBSERVED ☐ PREFER NOT ☐ BE WILLING ☐ BE GLAD ☐ PARTICULARLY DESIRE
17. HAS MARINE BEEN THE SUBJECT OF ANY OF THE FOLLOWING REPORTS? IF YES, REFERENCE IN SECTION C. a. COMMENDATORY ☐ YES ☐ NO b. ADVERSE ☐ YES ☐ NO c. DISCIPLINARY ACTION ☐ YES ☐ NO
18. REPORT BASED ON OBSERVATION ☐ DAILY ☐ FREQUENT ☐ INFREQUENT
19. QUALIFIED FOR PROMOTION ☐ NOT APPLICABLE ☐ YES ☐ NO
20. RECOMMENDATION FOR NEXT DUTY CONCUR (ITEM 10) 1 2 3 | NONCONCUR A B C
21. RESERVED FOR FUTURE USE
CONSIDER THE MARINE REPORTED ON IN COMPARISON WITH ALL OTHERS WHOSE PROFESSIONAL ABILITIES ARE KNOWN TO YOU PERSONALLY

SECTION C. REPORTING SENIOR (USE TYPEWRITER)

RECORD A CONCISE APPRAISAL OF THE PROFESSIONAL CHARACTER OF MARINE REPORTED ON. THIS SPACE MUST NOT BE LEFT BLANK.

SECTION D. SIGNATURES

22. I CERTIFY the information in section A is correct to the best of my knowledge.
(Signature of Marine reported on) (Date)
23. I CERTIFY that to the best of my knowledge and belief all entries made hereon are true and without prejudice or partiality.
(Signature of Reporting Senior) (Date)
24. (Check one when required) I HAVE SEEN THIS COMPLETED REPORT AND ☐ I HAVE NO STATEMENT TO MAKE ☐ I HAVE ATTACHED A STATEMENT.
(Signature of Marine reported on) (Date)
25. REVIEWING OFFICER (Name, Grade, Service, Duty Assignment)
25a. INITIALS
25b. DATE

☐ ← STAPLE ADDITIONAL PAGES HERE

MARINE REPORTED ON (Last name) (First name) (M.I.)	GRADE	IDENTIFICATION NO.	PERIOD (From) (To)	OCCASION

REPORTING SENIOR'S CERTIFICATION

I certify that on the terminal date shown in Item 3 of Section A, I was the Reporting Senior for only those Marines of the same grade as shown in Item 15b of Section B. Those Marines are ALPHABETICALLY LISTED below. I rank this Marine as _____ of _____ (only rank Marines marked Outstanding in 15a and b; mark NA if not applicable).

NAME (Last, First, M.I.)	PMOS	NAME (Last, First, M.I.)	PMOS

SIGNATURE _____ DATE _____

REVIEWING OFFICER'S CERTIFICATION

1. ☐ I have not had sufficient opportunity to observe this Marine, so I have no comment.
2. ☐ I have had only limited opportunity to observe this Marine, but from what I have observed I generally concur with the Reporting Senior's marks in Items 15a and b.
3. ☐ I have had sufficient opportunity to observe this Marine, and concur with the Reporting Senior's marks in Items 15a and b.
4. ☐ I have had sufficient opportunity to observe this Marine, and do not concur with the Reporting Senior's marks in Items 15a and b. I would evaluate this Marine as _____ (Item 15a) and rank this Marine as _____ of _____ (only rank those evaluated as Outstanding (OS)).

REMARKS (mandatory if Item 4, above, is checked):

SIGNATURE _____ DATE _____

NOTE: The information above WILL NOT be entered into any computer program.

APPENDIX B. USMC FITNESS REPORT: AFTER 1999

USMC FITNESS REPORT (1610)
NAVMC 10835A (Rev. 1-99 (EF))
PREVIOUS EDITIONS WILL NOT BE USED
SN: 0109-LF-069-0600

DO NOT STAPLE THIS FORM

COMMANDANT'S GUIDANCE

The completed fitness report is the most important information component in manpower management. It is the primary means of evaluating a Marine's performance and is the Commandant's primary tool for the selection of personnel for promotion, augmentation, resident schooling, command, and duty assignments. Therefore, the completion of this report is one of an officer's most critical responsibilities. Inherent in this duty is the commitment of each Reporting Senior and Reviewing Officer to ensure the integrity of the system by giving close attention to accurate marking and timely reporting. Every officer serves a role in the scrupulous maintenance of this evaluation system, ultimately important to both the individual and the Marine Corps. Inflationary markings only serve to dilute the actual value of each report. Reviewing Officers will not concur with inflated reports.

A. ADMINISTRATIVE INFORMATION

1. Marine Reported On: a. Last Name | b. First Name | c. MI | d. SSN | e. Grade | f. DOR | g. PMOS | h. BILMOS

2. Organization: a. MCC | b. RUC | c. Unit Description

3. Occasion and Period Covered: a. OCC | b. From | To | c. Type

4. Duty Assignment (descriptive title):

5. Special: a. Adverse ☐ | b. Not Observed ☐ | c. Extended ☐

6. Marine Subject Of: a. Commendatory Material ☐ | b. Derogatory Material ☐ | c. Disciplinary Action ☐

7. Recommended For Promotion: a. Yes ☐ | b. No ☐ | c. N/A ☐

8. Special Information:
a. QUAL | d. HT(in.) | g. Reserve Component
b. PFT | e. WT | h. Future Use
c. Status | f. Body Fat | i. Future Use

9. Duty Preference: a. Code | b. Descriptive Title
1st
2nd
3rd

10. Reporting Senior: a. Last Name | b. Init | c. Service | d. SSN | e. Grade | f. Duty Assignment

11. Reviewing Officer: a. Last Name | b. Init | c. Service | d. SSN | e. Grade | f. Duty Assignment

B. BILLET DESCRIPTION

C. BILLET ACCOMPLISHMENTS

1. Marine Reported On: a. Last Name	b. First Name	c. MI	d. SSN	2. Occasion and Period Covered: a. OCC	b. From	To

D. MISSION ACCOMPLISHMENT

1. PERFORMANCE. Results achieved during the reporting period. How well those duties inherent to a Marine's billet, plus all additional duties, formally and informally assigned, were carried out. Reflects a Marine's aptitude, competence, and commitment to the unit's success above personal reward. Indicators are time and resource management, task prioritization, and tenacity to achieve positive ends consistently.

ADV	Meets requirements of billet and additional duties. Aptitude, commitment, and competence meet expectations. Results maintain status quo.		Consistently produces quality results while measurably improving unit performance. Habitually makes effective use of time and resources; improves billet procedures and products. Positive impact extends beyond billet expectations.		Results far surpass expectations. Recognizes and exploits new resources; creates opportunities. Emulated; sought after as an expert with influence beyond unit. Impact significant; innovative approaches to problems produce significant gains in quality and		N/O
	A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐	H ☐					

2. PROFICIENCY. Demonstrates technical knowledge and practical skill in the execution of the Marine's overall duties. Combines training, education and experience. Translates skills into actions which contribute to accomplishing tasks and missions. Imparts knowledge to others. Grade dependent.

ADV	Competent. Possesses the requisite range of skills and knowledge commensurate with grade and experience. Understands and articulates basic functions related to mission		Demonstrates mastery of all required skills. Expertise, education and experience consistently enhance mission accomplishment. Innovative troubleshooter and problem solver. Effectively imparts skills to subordinates.		True expert in field. Knowledge and skills impact far beyond those of peers. Translates broad-based education and experience into forward thinking, innovative actions. Makes immeasurable impact on mission accomplishment. Peerless teacher, selflessly imparts expertise to subordinates, peers, and		N/O
	A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐	H ☐					

JUSTIFICATION:

E. INDIVIDUAL CHARACTER

1. COURAGE. Moral or physical strength to overcome danger, fear, difficulty or anxiety. Personal acceptance of responsibility and accountability, placing conscience over competing interests regardless of consequences. Conscious, overriding decision to risk bodily harm or death to accomplish the mission or save others. The will to persevere despite uncertainty.

ADV	Demonstrates inner strength and acceptance of responsibility commensurate with scope of duties and experience. Willing to face moral or physical challenges in pursuit of mission accomplishment.		Guided by conscience in all actions. Proven ability to overcome danger, fear, difficulty or anxiety. Exhibits bravery in the face of adversity and uncertainty. Not deterred by morally difficult situations or hazardous responsibilities.		Uncommon bravery and capacity to overcome obstacles and inspire others in the face of moral dilemma or life-threatening danger. Demonstrated under the most adverse conditions. Selfless. Always places conscience over competing interests regardless of physical or personal consequences.		N/O
	A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐	H ☐					

2. EFFECTIVENESS UNDER STRESS. Thinking, functioning and leading effectively under conditions of physical and/or mental pressure. Maintaining composure appropriate for the situation, while displaying steady purpose of action, enabling one to inspire others while continuing to lead under adverse conditions. Physical and emotional strength, resilience and endurance are elements.

ADV	Exhibits discipline and stability under pressure. Judgment and effective problem-solving skills are evident.		Consistently demonstrates maturity, mental agility, and willpower during periods of adversity. Provides order to chaos through the application of intuition, problem-solving skills, and leadership. Composure reassures others.		Demonstrates seldom-matched presence of mind under the most demanding circumstances. Stabilizes any situation through the resolute and timely application of direction, focus and personal presence.		N/O
	A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐	H ☐					

3. INITIATIVE. Action in the absence of specific direction. Seeing what needs to be done and acting without prompting. The instinct to begin a task and follow through energetically on one's own accord. Being creative, proactive and decisive. Transforming opportunity into action.

ADV	Demonstrates willingness to take action in the absence of specific direction. Acts commensurate with grade, training and experience.		Self-motivated and action-oriented. Foresight and energy consistently transform opportunity into action. Develops and pursues creative, innovative solutions. Acts without prompting. Self-starter.		Highly motivated and proactive. Displays exceptional awareness of surroundings and environment. Uncanny ability to anticipate mission requirements and quickly formulate original, far-reaching solutions. Always takes decisive, effective action.		N/O
	A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐	H ☐					

JUSTIFICATION:

1. Marine Reported On:

a. Last Name	b. First Name	c. MI	d. SSN	2. Occasion and Period Covered: a. OCC	b. From	To

F. LEADERSHIP

1. LEADING SUBORDINATES. The inseparable relationship between leader and led. The application of leadership principles to provide direction and motivate subordinates. Using authority, persuasion, and personality to influence subordinates to accomplish assigned tasks. Sustaining motivation and morale while maximizing subordinates' performance.

														N/O
ADV	Engaged; provides instructions and directs execution. Seeks to accomplish mission in ways that sustain motivation and morale. Actions contribute to unit effectiveness.		Achieves a highly effective balance between direction and delegation. Effectively tasks subordinates and clearly delineates standards expected. Enhances performance through constructive supervision. Fosters motivation and enhances morale. Builds and sustains teams that successfully meet mission requirements. Encourages initiative and candor among subordinates.		Promotes creativity and energy among subordinates by striking the ideal balance of direction and delegation. Achieves highest levels of performance from subordinates by encouraging individual initiative. Engenders willing subordination, loyalty, and trust that allow subordinates to overcome their perceived limitations. Personal leadership fosters highest levels of motivation and morale, ensuring mission accomplishment even in the most difficult circumstances.								
	A ☐		B ☐		C ☐		D ☐		E ☐		F ☐		G ☐	H ☐	

2. DEVELOPING SUBORDINATES. Commitment to train, educate, and challenge all Marines regardless of race, religion, ethnic background, or gender. Mentorship. Cultivating professional and personal development of subordinates. Developing team players and esprit de corps. Ability to combine teaching and coaching. Creating an atmosphere tolerant of mistakes in the course of learning.

														N/O
ADV	Maintains an environment that allows personal and professional development. Ensures subordinates participate in all mandated development programs.		Develops and institutes innovative programs, to include PME, that emphasize personal and professional development of subordinates. Challenges subordinates to exceed their perceived potential thereby enhancing unit morale and effectiveness. Creates an environment where all Marines are confident to learn through trial and error. As a mentor, prepares subordinates for increased responsibilities and duties.		Widely recognized and emulated as a teacher, coach and leader. Any Marine would desire to serve with this Marine because they know they will grow personally and professionally. Subordinate and unit performance far surpassed expected results due to MRO's mentorship and team building talents. Attitude toward subordinate development is infectious, extending beyond the unit.								
	A ☐		B ☐		C ☐		D ☐		E ☐		F ☐		G ☐	H ☐	

3. SETTING THE EXAMPLE. The most visible facet of leadership: how well a Marine serves as a role model for all others. Personal action demonstrates the highest standards of conduct, ethical behavior, fitness, and appearance. Bearing, demeanor, and self-discipline are elements.

														N/
ADV	Maintains Marine Corps standards for appearance, weight, and uniform wear. Sustains required level of physical fitness. Adheres to the tenets of the Marine Corps core values.		Personal conduct on and off duty reflects highest Marine Corps standards of integrity, bearing and appearance. Character is exceptional. Actively seeks self- improvement in wide-ranging areas. Dedication to duty and professional example encourage others'		Model Marine, frequently emulated. Exemplary conduct, behavior, and actions are tone-setting. An inspiration to subordinates, peers, and seniors. Remarkable dedication to improving self and others.								
	A ☐		B ☐		C ☐		D ☐		E ☐		F ☐		G ☐	H ☐	

4. ENSURING WELL-BEING OF SUBORDINATES. Genuine interest in the well-being of Marines. Efforts enhance subordinates' ability to concentrate/focus on unit mission accomplishment. Concern for family readiness is inherent. The importance placed on welfare of subordinates is based on the belief that Marines take care of their own.

														N/O
ADV	Deals confidently with issues pertinent to subordinate welfare and recognizes suitable courses of action that support subordinates' well-being. Applies available resources, allowing subordinates to effectively concentrate on the mission.		Instills and/or reinforces a sense of responsibility among junior Marines for themselves and their subordinates. Actively fosters the development of and uses support systems for subordinates which improve their ability to contribute to unit mission accomplishment. Efforts to enhance subordinate welfare improve the unit's ability to accomplish its mission.		Noticeably enhances subordinates' well-being, resulting in a measurable increase in unit effectiveness. Maximizes unit and base resources to provide subordinates with the best support available. Proactive approach serves to energize unit members to "take care of their own," thereby correcting potential problems before they can hinder subordinates' effectiveness. Widely recognized for techniques and policies that produce results and build morale. Builds strong family atmosphere. Puts motto *Mission first, Marines always*, into action.								
	A ☐		B ☐		C ☐		D ☐		E ☐		F ☐		G ☐	H ☐	

5. COMMUNICATION SKILLS. The efficient transmission and receipt of thoughts and ideas that enable and enhance leadership. Equal importance given to listening, speaking, writing, and critical reading skills. Interactive, allowing one to perceive problems and situations, provide concise guidance, and express complex ideas in a form easily understood by everyone. Allows subordinates to ask questions, raise issues and concerns and venture opinions. Contributes to a leader's ability to motivate as well as counsel.

														N/O
ADV	Skilled in receiving and conveying information. Communicates effectively in performance of duties.		Clearly articulates thoughts and ideas, verbally and in writing. Communication in all forms is accurate, intelligible, concise, and timely. Communicates with clarity and verve, ensuring understanding of intent or purpose. Encourages and considers the contributions of others.		Highly developed facility in verbal communication. Adept in composing written documents of the highest quality. Combines presence and verbal skills which engender confidence and achieve understanding irrespective of the setting, situation, or size of the group addressed. Displays an intuitive sense of when and how to listen.								
	A ☐		B ☐		C ☐		D ☐		E ☐		F ☐		G ☐	H ☐	

JUSTIFICATION:

1. Marine Reported On: a. Last Name	b. First Name	c. MI	d. SSN	2. Occasion and Period Covered: a.OCC	b. From	To

G. INTELLECT AND WISDOM

1. PROFESSIONAL MILITARY EDUCATION (PME). Commitment to intellectual growth in ways beneficial to the Marine Corps. Increases the breadth and depth of warfighting and leadership aptitude. Resources include resident schools; professional qualifications and certification processes; nonresident and other extension courses; civilian educational institution coursework; a personal reading program that includes (but is not limited to) selections from the Commandant's Reading List; participation in discussion groups and military societies; and involvement in learning through new technologies.

ADV	Maintains currency in required military skills and related developments. Has completed or is enrolled in appropriate level of PME for grade and level of experience. Recognizes and understands new and creative approaches to service issues. Remains abreast of contemporary concepts and issues.		PME outlook extends beyond MOS and required education. Develops and follows a comprehensive personal program which includes broadened professional reading and/or academic course work; advances new concepts and ideas.		Dedicated to life-long learning. As a result of active and continuous efforts, widely recognized as an intellectual leader in professionally related topics. Makes time for study and takes advantage of all resources and programs. Introduces new and creative approaches to services issues. Engages in a broad spectrum of forums and dialogues.			N/O

A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

2. DECISION MAKING ABILITY. Viable and timely problem solution. Contributing elements are judgment and decisiveness. Decisions reflect the balance between an optimal solution and a satisfactory, workable solution that generates tempo. Decisions are made within the context of the commander's established intent and the goal of mission accomplishment. Anticipation, mental agility, intuition, and success are inherent.

ADV	Makes sound decisions leading to mission accomplishment. Actively collects and evaluates information and weighs alternatives to achieve timely results. Confidently approaches problems; accepts responsibility for outcomes.		Demonstrates mental agility; effectively prioritizes and solves multiple complex problems. Analytical abilities enhanced by experience, education, and intuition. Anticipates problems and implements viable, long-term solutions. Steadfast, willing to make difficult decisions.		mplex problems. Seldom matched analytical a			N/O

A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

3. JUDGMENT. The discretionary aspect of decision making. Draws on core values, knowledge, and personal experience to make wise choices. Comprehends the consequences of contemplated courses of action.

ADV	Majority of judgments are measured, circumspect, relevant, and correct.		Decisions are consistent and uniformly correct, tempered by consideration of their consequences. Able to identify, isolate and assess relevant factors in the decision making process. Opinions sought by others. Subordinates personal interests in favor of impartiality.		Decisions reflect exceptional insight and wisdom beyond this Marine's experience. Counsel sought by all; often an arbiter. Consistent, superior judgment inspires the confidence of seniors.			N/O

A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

JUSTIFICATION:

H. FULFILLMENT OF EVALUATION RESPONSIBILITIES

1. EVALUATIONS. The extent to which this officer serving as a reporting official conducted, or required others to conduct, accurate, uninflated, and timely evaluations.

ADV	Occasionally submitted untimely or administratively incorrect evaluations. As RS, submitted one or more reports that contained inflated markings. As RO, concurred with one or more reports from subordinates that were returned by HQMC for inflated marking.		Prepared uninflated evaluations which were consistently submitted on time. Evaluations accurately described performance and character. Evaluations contained no inflated markings. No reports returned by RO or HQMC for inflated marking. No subordinates' reports returned by HQMC for inflated marking. Few, if any, reports were returned by RO or HQMC for administrative errors. Section Cs were void of superlatives. Justifications were specific, verifiable, substantive, and where possible, quantifiable and supported the markings		No reports submitted late. No reports returned by either RO or HQMC for administrative correction or inflated markings. No subordinates' reports returned by HQMC for administrative correction or inflated markings. Returned procedurally or administratively incorrect reports to subordinates for correction. As RO nonconcurred with all inflated reports.			N/O

A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

JUSTIFICATION:

1. Marine Reported On a. Last Name	b. First Name	c. MI	d. SSN	2. Occasion and Period Covered a. OCC	b. From	To

I. DIRECTED AND ADDITIONAL COMMENTS

J. CERTIFICATION

1. I CERTIFY that to the best of my knowledge and belief all entries made hereon are true and without prejudice or partiality and that I have provided a signed copy of this report to the Marine Reported on.

(Signature of Reporting Senior) (Date in YYYYMMDD format)

2. I ACKNOWLEDGE the adverse nature of this report and

☐ I have no statement to make

☐ I have attached a statement

(Signature of Marine Reported On) (Date in YYYYMMDD format)

K. REVIEWING OFFICER COMMENTS

1. OBSERVATION: ☐ Sufficient ☐ Insufficient **2. EVALUATION:** ☐ Concur ☐ Do Not Concur

3. COMPARATIVE ASSESSMENT: Provide a comparative assessment of potential by placing an "X" in the appropriate box. In marking the comparison, consider all Marines of this grade whose professional abilities are known to you personally.

DESCRIPTION		COMPARATIVE ASSESSMENT
THE EMINENTLY QUALIFIED MARINE	☐	
ONE OF THE FEW EXCEPTIONALLY QUALIFIED MARINES	☐ ☐	
ONE OF THE MANY HIGHLY QUALIFIED PROFESSIONALS WHO FORM THE MAJORITY OF THIS GRADE	☐ ☐ ☐	
A QUALIFIED MARINE	☐	
UNSATISFACTORY	☐	

4. REVIEWING OFFICER COMMENTS: Amplify your comparative assessment mark; evaluate potential for continued professional development to include: promotion, command, assignment, resident PME, and retention; and put Reporting Senior marks and comments in perspective.

5. I CERTIFY that to the best of my knowledge and belief all entries made hereon are true and without prejudice or partiality.

(Signature of Reviewing Officer) (Date in YYYYMMDD format)

6. I ACKNOWLEDGE the adverse nature of this report and

☐ I have no statement to make

☐ I have attached a statement

(Signature of Marine Reported On) (Date in YYYYMMDD format)

L. ADDENDUM PAGE

ADDENDUM PAGE ATTACHED: YES

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APPENDIX C. DIVISION OF MILITARY OCCUPATIONAL SPECIALTIES INTO CATEGORIES

Ground Combat MOS Group			
03XX	Infantry	08XX	Artillery
13XX	Combat Engineer, Construction, Facilities and Equipment	18XX	Tank and Assault Amphibian Vehicle
Ground Support MOS Group			
02XX	Intelligence	06XX	Command and Control Systems
21XX	Ordnance	23XX	Ammunition and Explosive Ordnance Disposal
25XX	Operational Communications	26XX	Signals Intelligence / Ground Electronics Warfare
30XX	Supply Administration and Operations	35XX	Motor Transport
57XX	Nuclear, Biological and Chemical	58XX	Military Police and Corrections
Service MOS Group			
01XX	Personnel and Administration	04XX	Logistics
11XX	Utilities	34XX	Financial Management
40XX	Data Systems	41XX	Marine Corps Exchange
43XX	Public Affairs	44XX	Legal Services
46XX	Training, Printing Production, and Visual Information Support	SEP MOS's	9954,9957,9958,9959,9962
Aviation MOS Group			
75XX	Naval Pilots / Naval Flight Officers	SEP MOS's	9965, 9967, 9969
Aviation Support MOS Group			
59XX	Electronics Maintenance	60XX	Aviation Maintenance
63XX	Avionics	66XX	Aviation Supply
72XX	Air Control/Air Support/Anti-air Warfare /Air Traffic Control	73XX	Navigation Officer / Enlisted Flight Crews

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APPENDIX D. TBS ACADEMIC, LEADESHIP AND MILITARY CLASS RANK MULTIVARIATE REGRESSION ANALYSIS RESULTS

Table D.1. Ordinary Least Squares Estimates of TBS Leadership Class Standing Percentile.

Variable	Model 1			Model 2		
	Mean Value	Coefficient (Std. Error)	P- Value	Mean Value	Coefficient (Std. Error)	P- Value
Intercept	-	47.363	< .0001	-	37.871	< .0001
Married_acc	0.287	0.545 (0.39)	< .164	0.264	- 0.186 (0.68)	0.683
Comm_age	23.35	0.305 (0.11)	.0048	23.36	0.505 (0.12)	< .0001
Female	0.047	- 7.715 (0.81)	< .0001	0.046	-6.865 (0.92)	< .0001
White (base case)	0.868			0.866		
Africaname	0.060	- 16.974 (0.71)	< .0001	0.061	-14.868 (0.815)	< .0001
Hispanic	0.040	- 11.095 (0.86)	< .0001	0.041	- 9.780 (0.97)	< .0001
Otherrace	0.032	- 9.063 (0.95)	< .0001	0.032	-8.429 (1.07)	< .0001
Avioption	0.316	- 1.759 (0.44)	< .0001	0.316	-2.816 (0.50)	< .0001
Lawoption	0.028	- 2.100 (1.06)	< .0466	0.028	-2.992 (1.19)	.0117
Priorenl	0.207	3.251 (0.59)	< .0001	0.207	3.459 (0.66)	< .0001
USNA (base case)	0.112			0.114		
NROTC	0.188	1.063 (0.71)	.6621	0.189	0.835 (0.81)	.3048
PLC	0.366	- 4.098 (0.60)	< .0001	0.363	- 1.331 (0.69)	.0527
OCC	0.252	- 7.374 (0.70)	< .0001	0.257	- 5.518 (0.79)	< .0001
MECEP	0.038	16.367 (1.24)	< .0001	0.036	16.282 (1.41)	< .0001
ECP	0.036	1.120 (1.23)	.3621	0.034	2.203 (1.41)	.1188
MCP	0.008	8.763 (2.13)	< .0001	0.007	9.717 (2.53)	< .0001
GCTbotthird (base case)	-			0.349		
GCTmidthird	-			0.361	4.015 (0.46)	< .0001
GCTtopthird	-			0.290	7.216 (0.51)	< .0001
Leadership Class Rank Perc.	50.0	-		50.0		
		N = 27,532 R^2 =0.068	**P =.0001**		**N = 21,610 R^2 =0.074**	**P = .0001**

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

Table D.2. Ordinary Least Squares Estimates of TBS Academic Class Standing Percentile.

Variable	Model 1			Model 2		
	Mean Value	Coefficient (Std. Error)	P- Value	Mean Value	Coefficient (Std. Error)	P- Value
Intercept	-	64.686 (2.44)	< .0001	-	37.672 (2.66)	< .0001
Married_acc	0.287	4.192 (0.39)	< .0001	0.264	3.400 (0.43)	< .0001
Comm_age	23.35	- 0.398 (0.11)	.0002	23.36	0.070 (0.12)	.5433
Female	0.047	- 7.125 (0.80)	< .0001	0.046	-4.249 (0.86)	< .0001
White (base case)	0.868			0.866		
Africaname	0.060	- 21.556 (0.71)	< .0001	0.061	-14.605 (0.76)	< .0001
Hispanic	0.040	- 11.121 (0.85)	< .0001	0.041	- 7.173 (0.90)	< .0001
Otherrace	0.032	- 5.162 (0.94)	< .0001	0.032	-3.898 (1.00)	< .0001
Avioption	0.316	1.138 (0.43)	< .0084	0.316	-1.105 (0.46)	.0172
Lawoption	0.028	13.930 (1.04)	< .0001	0.028	11.579 (1.11)	< .0001
Priorenl	0.207	1.962 (0.58)	< .0008	0.207	2.714 (0.61)	< .0001
USNA (base case)	0.112			0.114		
NROTC	0.188	-0.063 (0.71)	.9296	0.189	1.705 (0.76)	.0247
PLC	0.366	- 9.466 (0.59)	< .0001	0.363	- 2.160 (0.64)	.0007
OCC	0.252	-10.569 (0.69)	< .0001	0.257	- 4.879 (0.74)	< .0001
MECEP	0.038	12.658 (1.22)	< .0001	0.036	11.244 (1.32)	< .0001
ECP	0.036	-0.782 (1.21)	.5196	0.034	2.616 (1.32)	.0470
MCP	0.008	5.822 (2.10)	< .0057	0.007	12.252 (2.36)	< .0001
GCTbotthird (base case)	-			0.349		
GCTmidthird	-			0.361	4.015 (0.46)	< .0001
GCTtopthird	-			0.290	7.216 (0.51)	< .0001
Academic Class Rank Perc.	50.0	-		50.0		
		N = 27,529 R^2 =0.092	**P = .001**		**N = 21,610 R^2 =0.196**	**P = .001**

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

Table D3.A includes variables means for TBS military class rank analysis sample. The FY 1980 through 1982 cohorts are excluded from the sample since these cohorts are missing TBS military class rank data in the MCCOAC file.

Table D3.A. Sample Means by Commissioning Source [a].

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP
TBS Military Class Rank Percentile	56.60	52.69	48.87	43.92	65.31	52.69	59.43
Married at Accession	0.091	0.163	0.228	0.249	0.746	0.566	0.783
Commissioning Age	22.35	22.33	22.83	24.53	26.80	26.32	27.16
Female	0.049	0.055	0.010	0.099	0.059	0.006	0.039
White	0.848	0.910	0.868	0.821	0.817	0.838	0.680
African American	0.070	0.043	0.050	0.082	0.091	0.098	0.158
Hispanic	0.045	0.022	0.045	0.058	0.060	0.038	0.103
Other Race	0.037	0.026	0.037	0.039	0.032	0.026	0.059
Aviation Option	0.766	0.018	0.446	0.193	0	0	0
Law Option	0	0	0.070	0.030	0	0	0
Prior Enlisted	0.019	0.036	0.073	0.431	1.0	1.0	1.0
N	0.111	0.188	0.367	0.251	0.040	0.035	0.009
Number	**2,606**	**4,400**	**8,595**	**5,888**	**932**	**816**	**203**

[a] Reduced sample for TBS Military Class Rank Analysis, N=23,440

Table D3.B below includes mean values for TBS military class rank, GCT third groups, and prior enlisted variables for TBS military class rank analysis after GCT is included. In addition to cohorts missing military class rank data from 1980 through 1982, the FY 1990 and 1999 cohorts are also removed from the sample because these cohorts are missing GCT data for more than one-third of their cohort sizes. The analysis sample has 20,087 observations from the 15 cohorts.

Table D3.B. Sample Means by Commissioning Source [b].

Variable	USNA	NROTC	PLC	OCC	MECEP	ECP	MCP
TBS Military Class Rank Percentile	53.77	52.38	49.30	44.44	64.97	52.32	59.20
GCTbotthird	0.140	0.241	0.417	0.450	0.219	0.454	0.566
GCTmidthird	0.328	0.365	0.375	0.359	0.380	0.325	0.273
GCTtopthird	0.532	0.395	0.207	0.191	0.402	0.221	0.161
Prior Enlisted	0.018	0.031	0.066	0.369	1.0	1.0	1.0
N	0.114	0.192	0.363	0.253	0.036	0.034	0.007
Number	**2,305**	**3,850**	**7,298**	**5,090**	**727**	**674**	**143**

[b] Reduced sample for TBS Military Class Rank Analysis when GCT is included, N=20,087

Table D.4. Ordinary Least Squares Estimates of TBS Military Class Standing Percentile.

Variable	Model 1			Model 2		
	Mean Value	Coefficient (Std. Error)	P- Value	Mean Value	Coefficient (Std. Error)	P- Value
Intercept	-	55.206 (2.60)	< .0001	-	33.677 (2.82)	< .0001
Married_acc	0.243	2.836 (0.45)	< .0001	0.243	2.172 (0.47)	< .0001
Comm_age	23.43	- 0.116 (0.11)	.3093	23.38	0.261 (0.12)	.0316
Female	0.047	- 13.978 (0.86)	< .0001	0.046	-12.752 (0.911)	< .0001
White (base case)	0.857			0.862		
Africaname	0.063	- 24.555 (0.74)	< .0001	0.062	-19.398 (0.80)	< .0001
Hispanic	0.045	- 11.888 (0.87)	< .0001	0.042	- 8.988 (0.95)	< .0001
Otherrace	0.035	- 6.555 (0.97)	< .0001	0.034	-5.836 (1.04)	< .0001
Avioption	0.301	6.392 (0.47)	< .0001	0.311	4.760 (0.50)	< .0001
Lawoption	0.032	- 3.534 (1.05)	< .0008	0.030	- 6.145 (1.14)	< .0001
Priorenl	0.227	1.962 (0.58)	< .2167	0.216	1.458 (0.64)	< .0234
USNA (base case)	0.111			0.115		
NROTC	0.188	1.701 (0.76)	.0260	0.192	3.552 (0.80)	< .0001
PLC	0.367	- 4.854 (0.64)	< .0001	0.363	1.518 (0.68)	.0254
OCC	0.251	- 6.257 (0.75)	< .0001	0.253	- 0.993 (0.79)	.2102
MECEP	0.040	14.333 (1.30)	< .0001	0.036	13.371 (1.40)	< .0001
ECP	0.035	1.291 (1.32)	.3277	0.034	4.398 (1.40)	.0017
MCP	0.009	10.437 (2.14)	< .0001	0.007	14.559 (2.44)	< .0001
GCTbotthird (base case)	-			0.355		
GCTmidthird	-			0.362	10.045 (0.46)	< .0001
GCTtopthird	-			0.283	17.721 (0.51)	< .0001
Military Class Rank Perc.	50.0	-		50.0		
		N = 23,440 R^2 =0.1031	P = .0001		N = 20,087 R^2 =0.1499	P = .0001

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

APPENDIX E. BIVARIATE PROBIT WITH SAMPLE SELECTION RESULTS FOR SURVIVAL TO O-4 AND O-5 PROMOTION BOARDS

Table E.1. Bivariate Probit Estimates of Survival to O-4 and O-5 Promotion Boards.

Variable	Survived_O4Board		Survived_O5Board	
	Mean Value	Coefficient (Std. Error)	Mean Value	Coefficient (Std. Error)
Intercept	-			
Married_Acc	0.344	0.181*** (0.024)	0.546	0.146*** (0.037)
Comm_age	23.04	- 0.011*** (0.024)	23.00	- 0.039*** (0.004)
Female	0.039	0.062 (0.055)	0.043	0.042 (0.092)
White (base case)	0.895		0.924	
Africaname	0.052	0.060 (0.487)	0.045	- 0.020 (0.097)
Hispanic	0.027	- 0.061 (0.670)	0.016	0.099 (0.156)
Otherrace	0.026	- 0.032 (0.066)	0.015	0.127 (0.145)
TBS Overall Class Rank Percentile	50.20	0.005*** (0.001)	50.71	0.006*** (0.001)
Combat_MOS (base case)	0.326	N.A.	0.307	
Grsupport_MOS	0.187	- 0.140*** (0.031)	0.191	- 0.070* (0.053)
Service_MOS	0.137	- 0.096*** (0.035)	0.133	0.001 (0.061)
Aviation_MOS	0.281	0.320*** (0.027)	0.313	- 0.176*** (0.046)
Avsupport_MOS	0.089	- 0.106*** (0.039)	0.072	0.011 (0.073)
Nopromote	0.033	- 0.738*** (0.077)	0.039	- 0.817*** (0.141)
Accpromote	0.084	0.823*** (0.039)	0.154	0.863*** (0.047)
Priorenl	0.119	0.274*** (0.050)	0.086	0.513*** (0.111)
USNA (base case)	0.105		0.100	
NROTC	0.197	- 0.029 (0.039)	0.164	- 0.031 (0.070)
PLC	0.406	- 0.205*** (0.037)	0.373	- 0.019 (0.064)
OCC	0.228	- 0.250*** (0.042)	0.299	0.095* (0.069)

Table E.1. Bivariate Probit Estimates of Survival to O-4 and O-5 Promotion Boards (cont.)

Variable	Survived_O4Board		Survived_O5Board	
	Mean Value	Coefficient (Std. Error)		Coefficient (Std. Error)
MECEP	0.028	0.500*** (0.096)	0.025	- 0.898*** (0.171)
ECP	0.036	- 0.034 (0.082)	0.041	- 0.214* (0.149)
FY-80 (base case)	0.076		0.192	
FY-81	0.079	- 0.171*** (0.049)	0.204	- 0.068 (0.055)
FY-82	0.100	- 0.374*** (0.048)	0.264	- 0.204*** (0.054)
FY-83	0.131	- 0.259*** (0.046)	0.340	- 0.187*** (0.052)
FY-84	0.097	- 0.205*** (0.050)		
FY-85	0.084	- 0.110** (0.052)		
FY-86	0.083	0.039 (0.052)		
FY-87	0.101	- 0.182*** (0.051)		
FY-88	0.083	- 0.018 (0.053)		
FY-89	0.090	0.068* (0.053)		
FY-90	0.075	0.082*** (0.054)		
rho		- 0.425*** (0.065)		- 0.176** (0.086)
Survivad_O-4Brd/ O-5 Brd	0.466		0.300	
	N = 15,627 -2 Log L =17,550.94 P = <.0001		**N = 5,954 -2 Log L =16,972.06 P = <.0001**	

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

APPENDIX F. OLS ESTIMATES OF O3 AND O4 PI MODELS

Table F.1. OLS Estimates of O3 and O4 Performance Index Based on Old Fitreps.

Variable	O-3 PI			O-4 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
Intercept	-	99.188 (0.447)	98.011 (0.444)	-	100.190 (0.514)	99.795 (0.521)
Married_O3/O4	0.617	0.838*** (0.058)	0.771*** (0.058)	0.624	0.855*** (0.070)	0.814*** (0.070)
Comm_age	23.06	- 0.115*** (0.020)	- 0.117*** (0.020)	23.07	- 0.064*** (0.023)	- 0.064*** (0.023)
Female	0.038	0.059 (0.149)	0.182 (0.152)	0.043	0.222* (0.166)	0.251* (0.175)
White (base case)	0.906			0.944		
Africaname	0.045	- 0.795*** (0.136)	- 0.202* (0.137)	0.033	- 0.326** (0.186)	- 0.168 (0.188)
Hispanic	0.025	- 0.231* (0.180)	0.056 (0.177)	0.011	0.157 (0.323)	0.204 (0.323)
Otherrace	0.025	- 0.198 (0.181)	- 0.090 (0.178)	0.013	- 0.054 (0.293)	0.018 (0.293)
Combat Fitrep O3 / O4	0.165	0.750*** (0.078)	0.659*** (0.077)	0.018	0.156 (0.249)	0.103 (0.249)
Joint_O4	-	N.A.	N.A	0.134	0.289*** (0.099)	0.302*** (0.099)
TBS Overall Class Rank Percentile	52.72	N.A.	0.022*** (0.001)	56.08	N.A.	0.005*** (0.001)
Combat_MOS (base case)	0.305			0.335		
Grsupport_MOS	0.162	N.A.	0.040 (0.085)	0.161	N.A.	0.097 (0.099)
Service_MOS	0.136	N.A.	-0.042 (0.093)	0.134	N.A.	0.116 (0.112)
Aviation_MOS	0.336	N.A.	-0.026 (0.070)	0.311	N.A.	0.201*** (0.083)
Avsupport_MOS	0.078	N.A.	0.128 (0.108)	0.076	N.A.	0.189* (0.130)
Priorenl	0.124	0.557*** (0.135)	0.410*** (0.133)	0.103	0.314* (0.198)	0.240 (0.199)
USNA (base case)	0.113			0.098		
NROTC	0.198	-0.018 (0.105)	- 0.060 (0.103)	0.180	-0.076 (0.132)	-0.045 (0.133)
PLC	0.406	- 0.447*** (0.095)	- 0.299*** (0.094)	0.372	- 0.011 (0.120)	0.036 (0.120)
OCC	0.214	- 0.409*** (0.112)	- 0.231** (0.111)	0.281	0.068 (0.131)	0.117 (0.131)
MECEP	0.032	0.099 (0.224)	- 0.188 (0.220)	0.024	- 0.471* (0.302)	- 0.443* (0.302)
ECP	0.037	- 0.586*** (0.214)	- 0.654*** (0.211)	0.046	- 0.275 (0.261)	- 0.223 (0.261)

Table F.1. OLS Estimates of O3 and O4 Performance Index Based on Old Fitreps (Cont.)

Variable	O-3 PI			O-4 PI		
	Mean Value	Model 1	Model 2	Mean Value	Model 1	Model 2
		Coefficient (Std. Error)	Coefficient (Std. Error)		Coefficient (Std. Error)	Coefficient (Std. Error)
Comm_FY 1980 (base case)	0.091			0.220		
Comm_FY 1981	0.087	0.114 (0.133)	0.123 (0.130)	0.220	0.097 (0.099)	0.093 (0.100)
Comm_FY 1982	0.098	0.348*** (0.129)	0.343*** (0.127)	0.245	0.163** (0.097)	0.154* (0.097)
Comm_FY 1983	0.122	0.750*** (0.123)	0.718*** (0.121)	0.315	0.161** (0.093)	0.144* (0.093)
Comm_FY 1984	0.090	1.092*** (0.133)	1.070*** (0.130)			
Comm_FY 1985	0.082	1.537*** (0.135)	1.501*** (0.133)			
Comm_FY 1986	0.084	1.803*** (0.134)	1.826*** (0.132)			
Comm_FY 1987	0.097	2.099*** (0.131)	2.088*** (0.129)			
Comm_FY 1988	0.083	2.457*** (0.136)	2.471*** (0.134)			
Comm_FY 1989	0.090	2.528*** (0.134)	2.544*** (0.131)			
Comm_FY 1990	0.078	2.504*** (0.138)	2.521*** (0.136)			
PI	98.247			99.405		
		N = 12,488 R^2 **=0.107**	**N= 12,488** R^2 **= 0.140**		**N= 2,802** R^2 **=0.065**	**N= 2,802** R^2 **=0.072**

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

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